MODEL AIRPLANE NEWS

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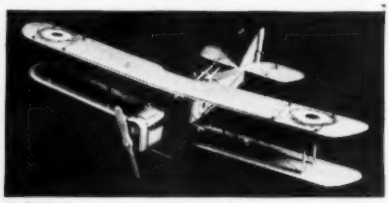
WESTLAND WAGTAIL

De.H.5

LOOK ..... F.E.2 B. ..... LOOK



LOOK ..... De.H.4 .....LOOK

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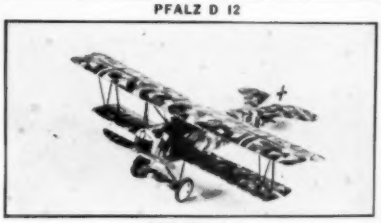
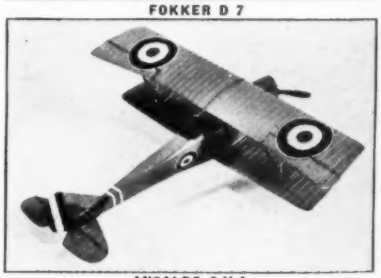


FOKKER D 7



ANSALDO S.V.A.

NIEUPORT 17

NIEUPORT 28

Model AIRPLANE News

VOL. XII NO. 4

Edited by Charles Hampson Grant

CONTENTS

MAY, 1935

In Our Next Issue

The Glider Grows Up, by Fletcher Pratt, shows how the art of gliding has developed from the pioneer days and how they have contributed to new developments in modern airplanes.

Gilbert MacLean tells you how you can build a very simple paper-covered model that young model fans can build and fly for over a minute in **A Model That's Easy to Build and Fly.**

John E. Roe gives you a fine detail three view drawing of the Bristol F2B (wartime).

Complete instructions and plans to build a flying scale model will be presented by William Winter and Walter McBride, in **Build and Fly The Great Lakes Torpedo Plane.**

There will be another easily made Silhouette-o-plane to build, for the young fellow who is just learning how to construct models, by Jesse Davidson.

Another **Airplane Observers Contest** will give lots of fun and cash awards to winners.

Also other interesting news, new construction ideas and design data will be given in, **Air Ways, N.A.A. Junior Membership News, Slipstreams, 3 Views of the Stearman "82", Aviation Advisory Board, The Aerodynamic Design of the Model Plane,** and **On The Frontiers Of Aviation.**

Order your copy of MODEL AIRPLANE NEWS from your newsdealer now or send $1.65 for your year's subscription to this office, 551 Fifth Avenue, New York City. Canadian subscriptions $2.50 per year. All other countries, $2.50.

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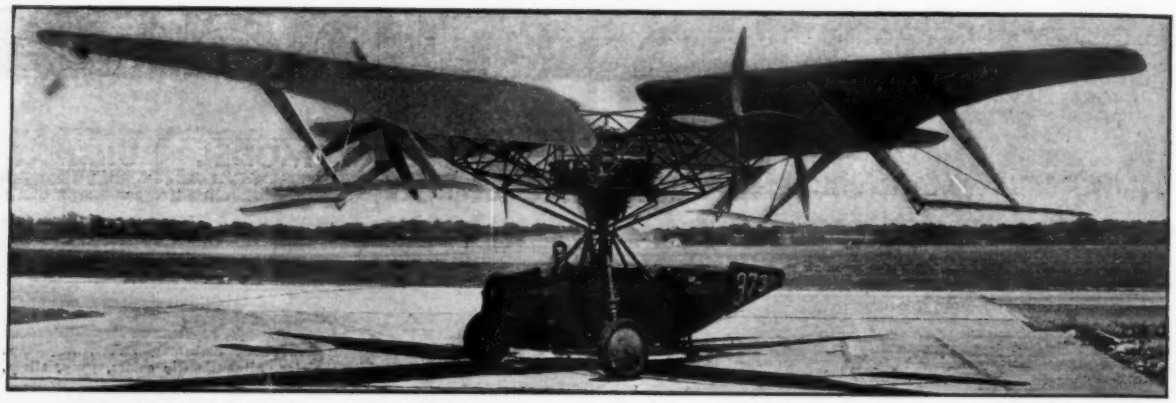


The Curtiss-Bleecker helicopter. One of the latest attempts to build a machine that would rise vertically, without success.

The Development of Vertical Flight

How Engineers Have Struggled to Create a Successful Helicopter and What They Have Accomplished

By LIEUT. H. LATANE LEWIS II

MANY of the leading aeronautical engineers in the United States have come to the conclusion that the aircraft of the future will be the helicopter, or something very like it. Before the full usefulness of an aircraft can be attained, most air people agree, it must be able to operate from areas scarcely larger than the ship itself.

Interest in the helicopter has taken a new lease on life in the past year or two and several new designs are under experimentation.

The idea of rising and descending vertically in heavier-than-air machines is probably as old as the idea of flying itself. Early in the fourteenth century, a bearded little Italian named Leonardo da Vinci worked night after night by the flickering light of an oil lamp, over a series of complicated drawings. Most people tapped their heads derisively when they heard what he was trying to do, but he fooled them. One day he emerged from his laboratory with a small model helicopter which actually raised itself by its own power and flew. It was nothing more than a toy, but it was the great-granddaddy of the modern machines.

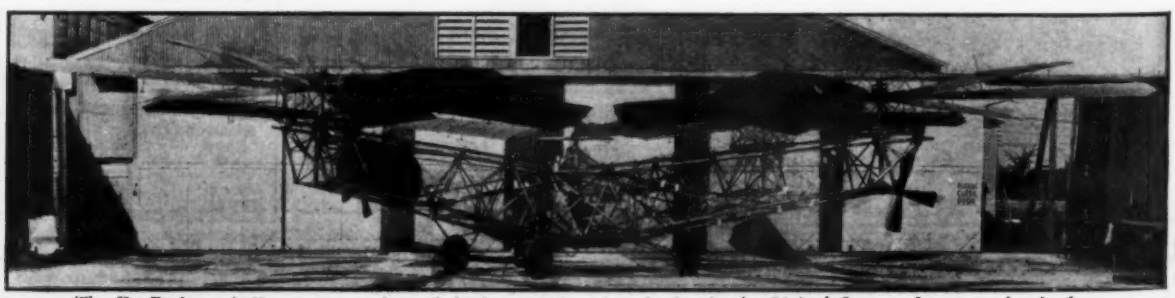
That's as far as da Vinci got with the science of aviation. He never built a man-carrying machine and it probably would not have flown if he had. Although models of helicopters and ornithopters (flapping wing machines) have been successful, full-scale ships have never reached a degree of efficiency comparable to airplanes.

The Karman Captini helicopter rising from the ground. It reached an altitude of 150 feet on this flight

The helicopter, it should be explained to those who are unfamiliar with this type of aircraft, derives its lift not from fixed wings, as does the airplane, but from lateral propellers which are driven by the engine. (The helicopter is not the same thing as the autogiro, as will be explained later.) At least two propellers are always provided and these are made to revolve in opposite directions to balance the torque. Otherwise the fuselage would be spun around like a top. For forward propulsion, the usual vertical propeller is employed.

Up until the World War, practically no progress had been made in helicopter development. The principle was known, but it was not fully understood. On the Western Front, it became evident over and over again that a machine capable of rising and descending vertically from small spaces, and of hovering motionless over an object, would be invaluable. The troops up near the lines could not keep in close enough touch with the air service. Photographs and other observations made from the air had to be landed at an airdrome miles behind the front and then sent up by motorcycle. In some cases this loss of time was disastrous.

Moreover, bombardment pilots realized that they could score a much greater percentage of hits if given a machine that could hover over the target and thus provide, in effect, a fixed base from which to fire.



The De Bothezat helicopter, a product of the best engineering brains in the United States. It rose only six feet

The Berliner helicopter in flight. This was one of the most successful attempts to fly vertically

There was not much time for exhaustive experimentation during the war, but soon afterwards the United States Government tackled the problem. The Air Corps built one helicopter in its shops at the old McCook Field and a number of others were constructed by private designers and demonstrated before Government officials.

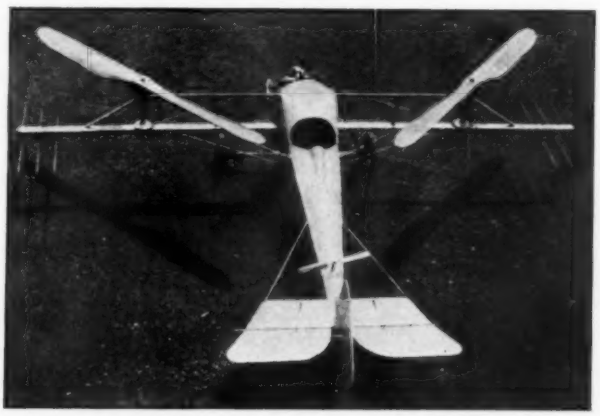
One of the first ships to show promise of performance was the Karman helicopter built in Europe. The accompanying photograph shows it taking off in a cloud of dust, and a few minutes after the camera clicked, it had reached an altitude of 150 feet.

It was an odd-looking affair. Three rotary engines drove two propellers, which were mounted on the same axis but rotated in opposite directions. The body was a three-sided framework with bags at each corner to ease the shock of landing. Note the ball-shaped container at the bottom of the machine. In these cramped quarters sat the pilot.

This machine was known as the captive type: that is, it was held to the ground by a cable just as is a captive balloon. It was not capable of horizontal movement but could simply rise and descend, so its only possible use was that of observation, and the low altitude that it attained did not make it worthwhile even for that.

Next came the De Bothezat helicopter, which was the work of the U.S. Army Air Corps Engineering Division.

This machine was considerably more elaborate than the Karman model. Ordinary propellers had not proven so good for lifting a ship vertically and Army designers decided to try something else. They constructed a six-bladed propeller, the blades of which were really on the order of small wings. They were 26½ feet in diameter.



The Berliner helicopter seen from above

Four of these airscrews were attached to a metal framework shaped like a cross and were driven by a gear system by a 200 horsepower 3R-2 engine. It is an interesting fact that two-thirds of the total weight of the machine was rotating when it was in flight.

Perhaps the ship was under-powered, which was a common fault in the early helicopters. At any rate its longest flight was only 1 minute and 42 seconds, and it attained a height of just six feet.

This was not so good. The De Bothezat helicopter had had some of the best engineering talent in the United States behind it. It began to look as if the helicopter principle were unsound and from then on engineers shied away from it.

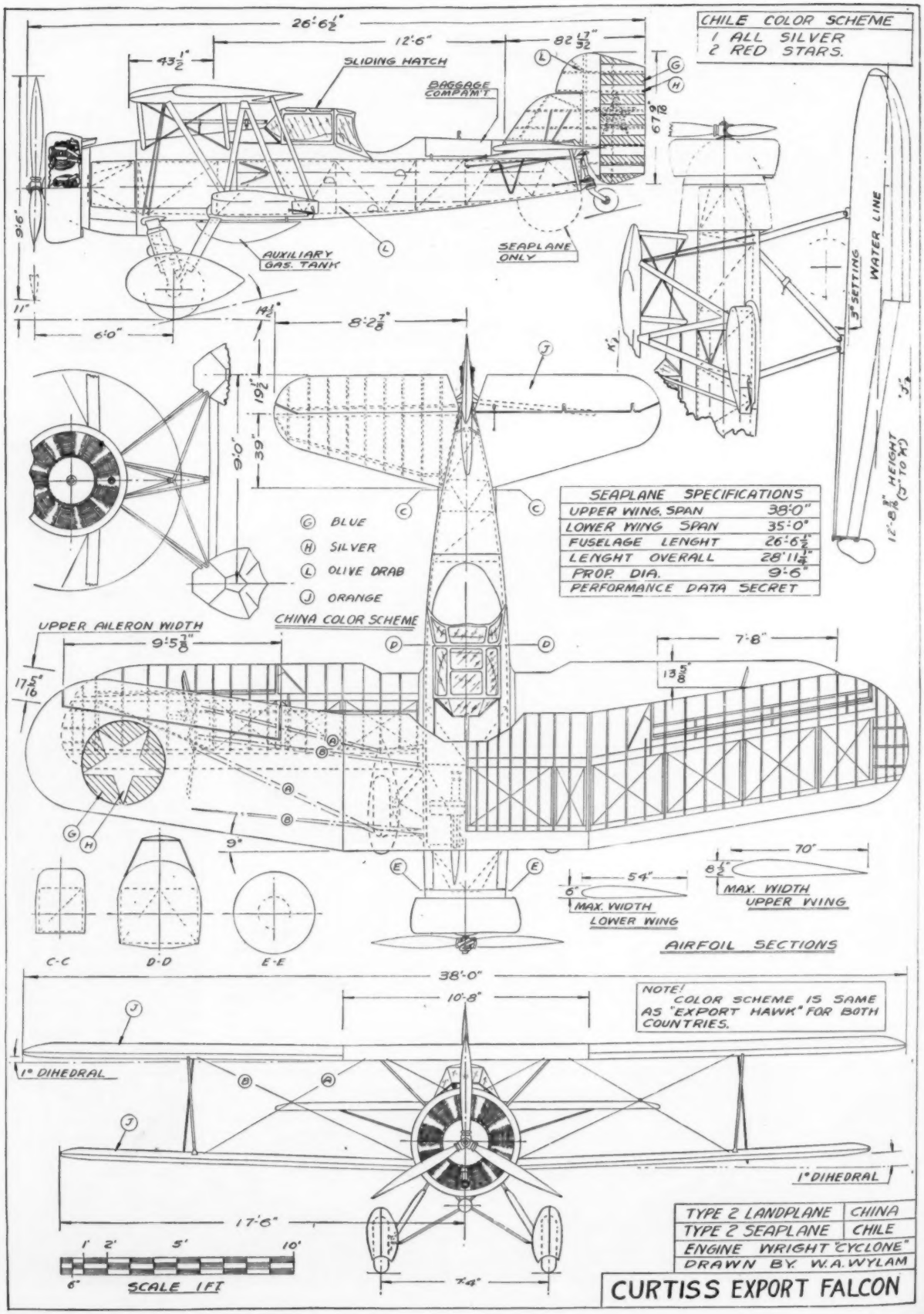
However, Henry Berliner and his father began tinkering with a peculiar contrivance that was, aeronautically speaking, neither beast nor fowl. In recent years Berliner has been constructing the famous Berliner-Joyce P-16s and other well-known planes for the Army and Navy, but in those days he was constantly coming out with some unheard-of discovery.

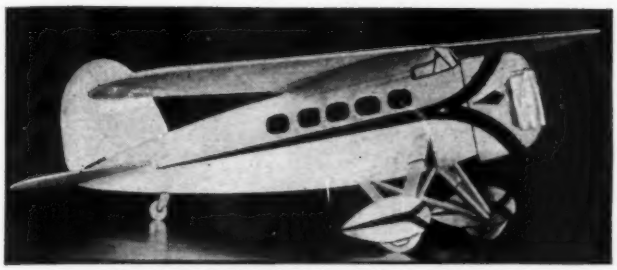
Berliner's strange craft proved to be the most successful helicopter ever designed, but at first glance it looked like a confused airplane. In general outline, it followed the form of an airplane in regard to engine location, disposal of

(Continued on page 42)

The Lewis PA-22 autogiro; one of the latest types

An early Pitcairn PCA-2 autogiro with wings


CHILE COLOR SCHEME
1 ALL SILVER
2 RED STARS.
26'-6½"
12'-6"
82 17/32"
43½"
SLIDING HATCH
BAGGAGE COMPAM'T
67 9/16"
9'-6"
11"
6'-0"
AUXILIARY GAS. TANK
SEAPLANE ONLY
WATER LINE
3° SETTING
12'-8⅛" HEIGHT (⅄ TO ⅄)
8'-2⅞"
10½"
9'-0"
39"
Ⓒ BLUE
Ⓗ SILVER
Ⓛ OLIVE DRAB
Ⓙ ORANGE
SEAPLANE SPECIFICATIONS
UPPER WING, SPAN 38'-0"
LOWER WING SPAN 35'-0"
FUSELAGE LENGHT 26'-6½"
LENGHT OVERALL 28'-11¼"
PROP. DIA. 9'-6"
PERFORMANCE DATA SECRET
CHINA COLOR SCHEME
UPPER AILERON WIDTH
9'-5⅞"
17 5/16"
7'-8"
13 5/8"
9°
54"
6"
MAX. WIDTH LOWER WING
70"
8½"
MAX. WIDTH UPPER WING
AIRFOIL SECTIONS
C-C
D-D
E-E
38'-0"
10'-8"
NOTE! COLOR SCHEME IS SAME AS "EXPORT HAWK" FOR BOTH COUNTRIES.
1° DIHEDRAL
1° DIHEDRAL
17'-6"
7'-4"
1' 2' 5' 10'
6" SCALE 1FT
TYPE 2 LANDPLANE CHINA
TYPE 2 SEAPLANE CHILE
ENGINE WRIGHT "CYCLONE"
DRAWN BY W.A. WYLAM
CURTISS EXPORT FALCON



Not the real ship, but the glider, ready to fly

A Model Anyone Can Build and Fly

How You Can Make a Flying Glider Model of the Famous Lockheed Vega from Scrap Wood—Another Plane for Your Miniature Airport

By JESSE DAVIDSON

MOST all of you remember not so long ago how the hawker at the carnival, air races, or county fair, would attract numbers of spectators to watch and admire how skillfully he threw those little wooden and paper gliders to perform loops, split S turns and figure eights. And what's more, you may recall how eagerly you bought one for 15c or 25c.

Now, perhaps, you are building your own gliders; made from odd bits of sheet balsa. But do they resemble actual large airplane types?

Here is a glider that you can immediately recognize as a representation of the famous Lockheed Vega. Unlike the old gliders sold by the hawkers, it has looks and would be an attractive unit in any model airport display.

From time to time sets of glider patterns for other distinctive airplanes will be printed so you may have a complete fleet of planes all your own.

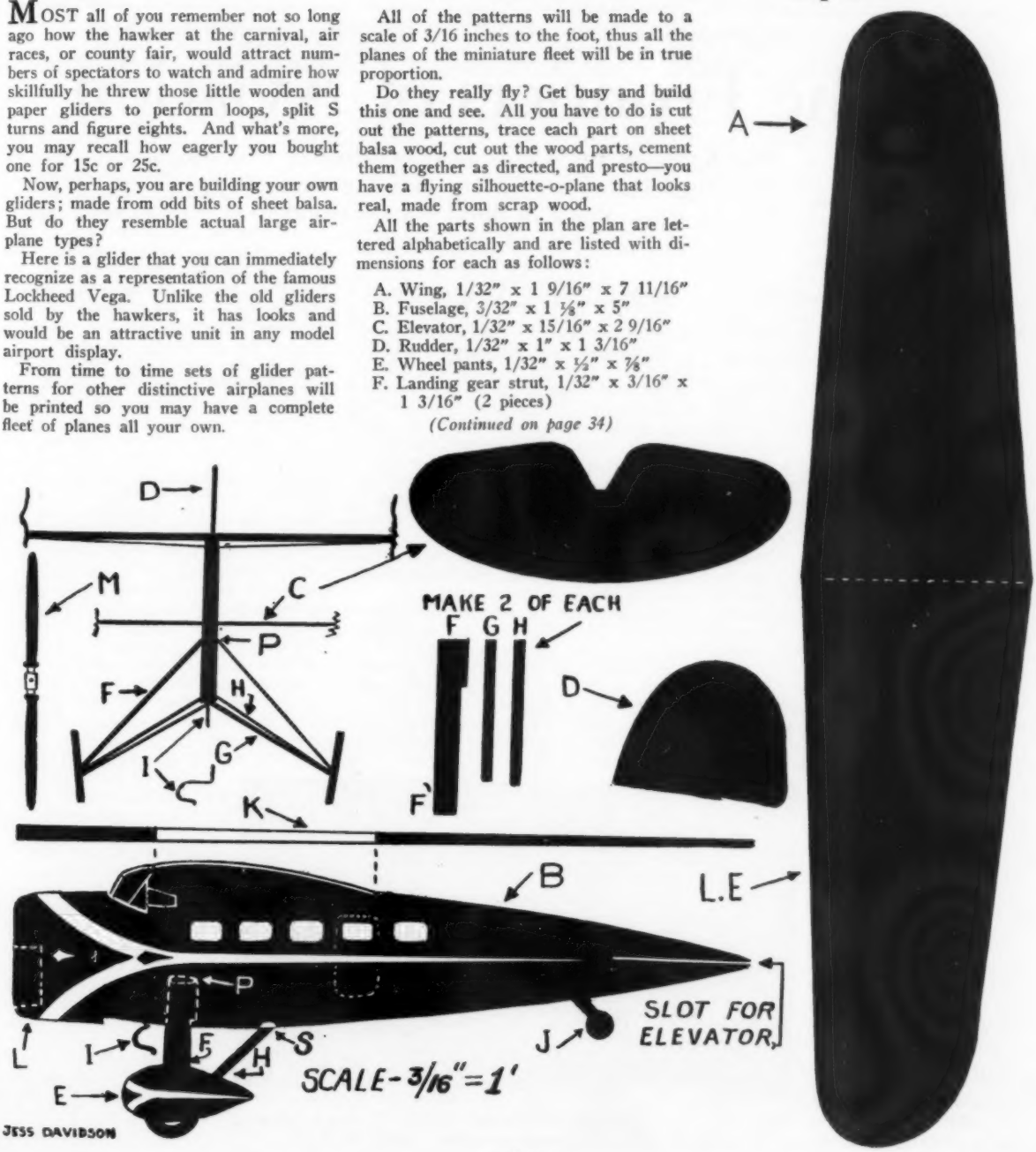
All of the patterns will be made to a scale of 3/16 inches to the foot, thus all the planes of the miniature fleet will be in true proportion.

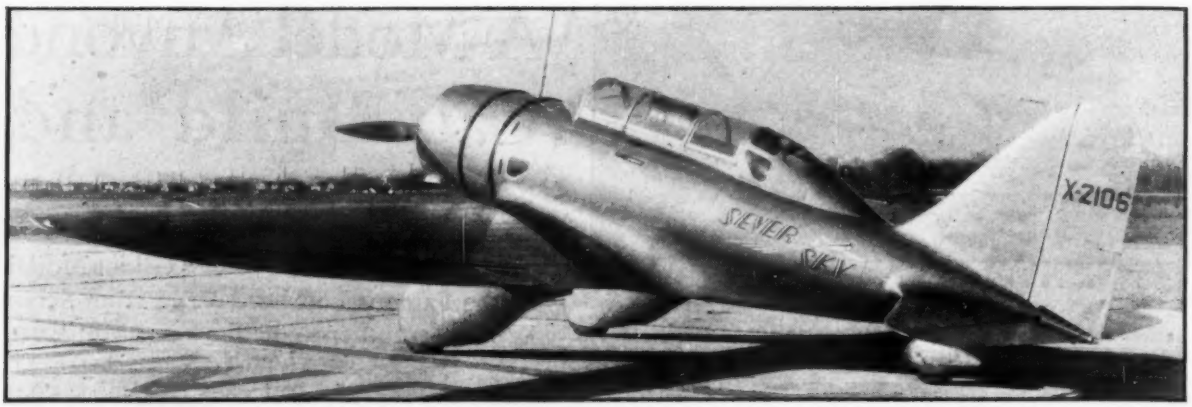
Do they really fly? Get busy and build this one and see. All you have to do is cut out the patterns, trace each part on sheet balsa wood, cut out the wood parts, cement them together as directed, and presto—you have a flying silhouette-o-plane that looks real, made from scrap wood.

All the parts shown in the plan are lettered alphabetically and are listed with dimensions for each as follows:

A. Wing, 1/32" x 1 9/16" x 7 11/16"
B. Fuselage, 3/32" x 1 ⅛" x 5"
C. Elevator, 1/32" x 15/16" x 2 9/16"
D. Rudder, 1/32" x 1" x 1 3/16"
E. Wheel pants, 1/32" x ½" x ⅞"
F. Landing gear strut, 1/32" x 3/16" x 1 3/16" (2 pieces)

(Continued on page 34)





The new Seversky Trainer which has a top speed of 200 m.p.h. It has been adapted as a trainer by the Army

On the Frontiers of Aviation

Highlights of the Latest Developments of Training, Transport, Racing and Fighting Planes—How You Can Build a Scale Model of the Brown Racer

By ROBERT C. MORRISON

WITHOUT doubt one of the planes with the most modern features in design is the new Seversky basic training plane. The ship is faster than the majority of our high-speed pursuit planes, which is quite extraordinary for a basic training plane as they are usually the slowest type of plane built throughout the world. The Seversky Aircraft Corp. has the following to say about their new plane.

"The choice of this airplane by the Army Air Corps as a trainer is a decided compliment to its design, since the plane's high performance and speed at first would suggest that it is too much plane for a student, but its ease of control, unusual stability and perfect behavior and control at stall, together with its low landing speed, makes it one of the safest airplanes for a student to fly. Its maneuverability, speed and high rate of climb compares favorably with the best fighters, and its stamina and rigidity is designed to withstand any abuses during training. After putting time on Seversky planes, a pilot can fly any type of airplane with equal ease."

Its performance follows:

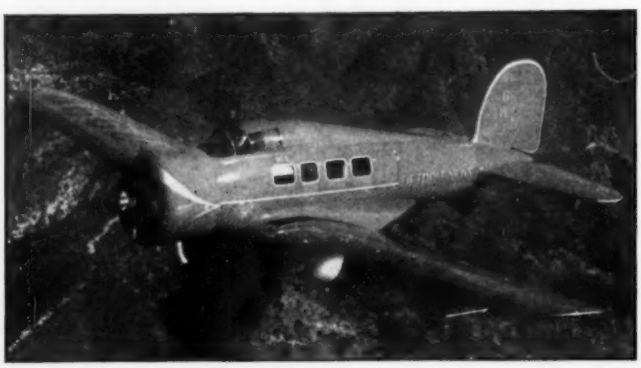
Top speed at sea level, 200 m.p.h.
Stalling speed at sea level, 60.5 m.p.h.
Climb in 10 minutes at sea level, 12,000 ft.
Service ceiling, 21,500 ft.
Operating speed, 187 m.p.h.
Range at full speed, 633 miles.
Range at operating speed, 742 miles.

The entire plane is of all-metal construction and closely resembles Major De Seversky's sport plane described in the February issue of UNIVERSAL MODEL AIRPLANE NEWS. As is the usual trend in modern aircraft design, stress is taken up by the metal skin.

A very interesting new feature of the plane is its gasoline tank. The center portion of the wing is riveted, forming an air-tight compartment. A special process has been developed by the Seversky Company in order to seal the tank. Practical tests during nearly two years of flying proved the dependability of this process. This feature will also be used by the company in connection with the entire wing which will make this metal wing buoyant in case of landing on water and the gas capacity can be increased at will, thus increasing the range to its maximum. In addition to the above advantages, this tank has a decided military advantage. Riddled with bullets, the tank could easily be repaired within a few minutes by specially designed outside patches.

Though the plane does not have a retractable landing gear, it has a training retractable gear mechanism so the student may acquire the habit of going through all the motions of handling a plane with retractable landing gear.

In less than an hour the Seversky may be converted into a seaplane or amphibian.



This is the latest Lockheed camera plane. Pictures are shot by pressing a button and by the use of gun sights. Speed 300 m.p.h.

A crash-proof head-rest is built between the two cockpits and contains loop antenna for the direction finding radio compass. The engine is cowled with double ventura cowling with minimum drag.

Some more interesting news has come to light on recent developments at the Lawrence W. Brown Aircraft Co. The company has moved into a new factory building with more than ten thousand square feet of floor space in order to meet the demands for Brown planes.

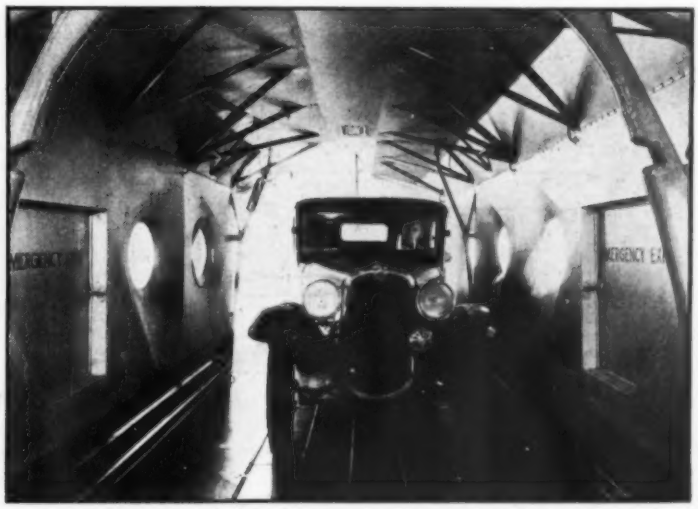
A new two-place commercial sport-touring plane is now under construction which closely resembles the Brown racer, plans of which appear in this issue. The first of the new type plane has already been sold, which is very encouraging for the rapidly expanding company. Top speed will be 210-225 m.p.h. and cruising speed will be over 180 m.p.h. A revamped version of the 300 hp. Menasco engine used in the "Miss Los Angeles" will be the power plant. Flaps and Handley Page automatic slots will be part of the equipment on the new Brown plane. Dual controls are to be fitted as standard in the two cockpits and each cockpit will have a sliding shield over the pilot instead of a door. Dimensions are as follows:

Total wing area, 150 sq. ft.
Span, 32 ft.
Length overall, 28 ft.
Gross weight approx. 2500 lb.

The plane will carry a bullet nose propeller spinner and rigid landing gear with large airwheels for shock absorption. The wing will have a racing airfoil section, probably a Curtiss speed section as on the "Miss Los Angeles". The wing is wood, steel tube and wire braced, and the fuselage is welded tube with cloth covering throughout except for metal cowling over engine compartment.

The Brown Company has

Loading freight on board the Curtiss Condor



View of an auto parked in the cargo compartment of the Curtiss Condor

been negotiating with a leading film company for construction of a special racing plane to play a leading role in a new flying picture which will feature violent stunting and inverted flying. It will also be powered with a Menasco.

The Brown Company has also been negotiating with one of the largest American aviation supply houses for distribution of its new Brown fighter (U.M.A.N., Feb.) in thirty-seven foreign countries. Early production of this military model is now in prospect.

The big new 1935 Brown racer is also likely to be completed in time for the Thompson Trophy Race.

Thus is the latest news on four new Brown planes. At the present time there are, comparatively speaking, very few of the air-cooled in-line powered types of planes in the United States. But all of these are very famous—for example, the Chester special, Miles & Atwood Special, Kieth Riders, Ryan ST, Howard racers, Fairchilds, Lockheed Alcor and Brown racers. The Menasco engine which leads the field in engines of that type have demonstrated their dependability and high-speed, and with a steady development of these engines into the higher horsepower classes there are unlimited resources. Even at present single-engined and twin-engined observation, pursuit, attack, and transport planes, etc., with Menasco engines could be built that would possibly equal or surpass the performances of our present air-cooled radial engined ships.

It was an in-line 380 hp. engine that pulled the French Caudron to a world's land plane speed record, and it was a De Havilland Comet with such a type of engine that won the MacRobertson Race. The Brown Company, at the completion of its present program, will undoubtedly produce many other designs of all types of military and commercial planes incorporating the Menasco engine which should be

Mr. Lawrence Brown looking over some models of his racer, built in his shop

overwhelmingly popular the world over. Such a type of plane is very popular now in England, but the English are very slow in benefiting completely from the many possibilities that it offers, and it is for this reason that we should watch with interest the fast growing Brown Company. Success is certain and the United States will have a wonderful opportunity of forging far ahead of England or any other country in the development of such a type of plane in the near future.

The date for the big international air race around South America with starting and finishing point at Washington, D.C., has been set for Oct. 6th, 1935. MODEL AIRPLANE NEWS will bring information from time to time on various racing planes built for this race which should attract more attention than even the MacRobertson Race did.

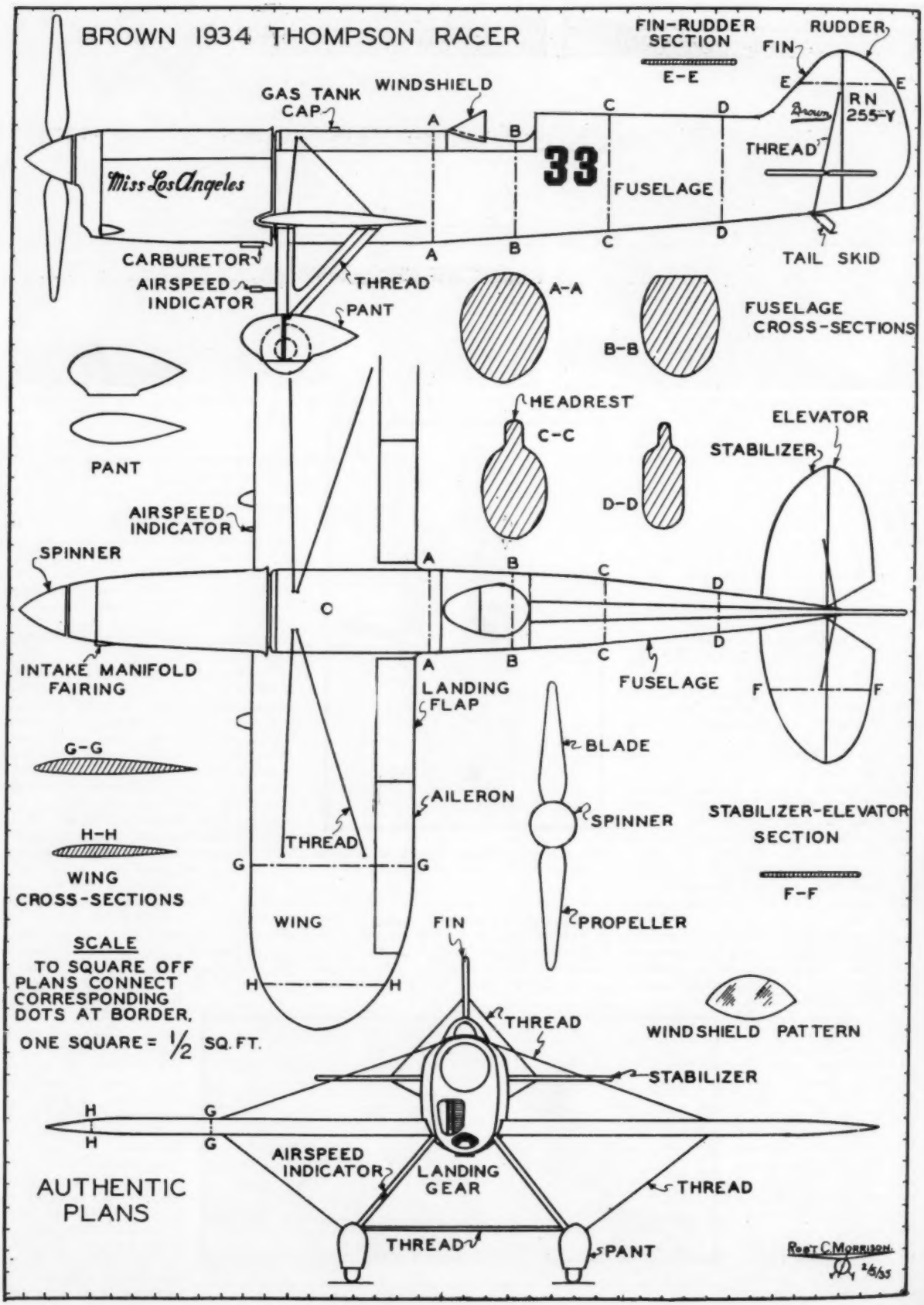
The Curtiss Company was rather unfortunate in not receiving any Army Air Corps orders of recent date, but prospects look good for the future. Their latest Curtiss pursuit plane, about which much secrecy is involved, has an excellent chance in beating out the Northrop, Boeing, Lockheed, B/J and other pursuits for a large Navy order, which is to be let in a few months. The plane's performance is of course confidential and so are its major design features, but it is safe to say that the plane is all-metal and skin-stressed. This is a decided departure from the usual trend of construction of Curtiss planes. The machine-guns are inside the cockpit so they can easily be reached by the pilot if they become jammed. There is also a lever in the enclosed cockpit to release a complete side of the cockpit so the pilot may easily "bail out" in case the ship is shot down by four or five enemy planes. Landing gear is retractable.

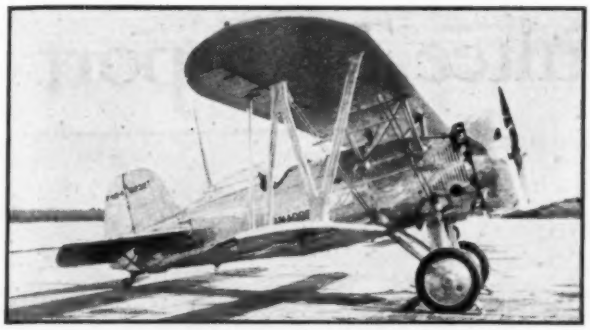
A twin-engined Curtiss attack plane is also under construction. It is possibly a version of the A-12. The new ship will be known as the A-14.

A Curtiss Condor troop transport and cargo plane has also been developed. It is very similar to other Condors with the exception of its interior. The interior compartment dimensions are as follows:

(Continued on page 40)

Here is the new Curtiss Condor Cargo plane. It can carry an automobile in its spacious body. Speed 190 m.p.h.


BROWN 1934 THOMPSON RACER
FIN-RUDDER SECTION
E-E
RUDDER
FIN
GAS TANK CAP
WINDSHIELD
RN 255-Y
THREAD
Miss Los Angeles
33
FUSELAGE
CARBURETOR
AIRSPEED INDICATOR
THREAD
PANT
TAIL SKID
A-A
B-B
FUSELAGE CROSS-SECTIONS
PANT
HEADREST
C-C
D-D
ELEVATOR
STABILIZER
AIRSPEED INDICATOR
SPINNER
INTAKE MANIFOLD FAIRING
LANDING FLAP
FUSELAGE
G-G
BLADE
AILERON
SPINNER
STABILIZER-ELEVATOR SECTION
H-H
WING CROSS-SECTIONS
THREAD
WING
F-F
PROPELLER
SCALE
TO SQUARE OFF PLANS CONNECT CORRESPONDING DOTS AT BORDER.
ONE SQUARE = 1/2 SQ. FT.
FIN
THREAD
WINDSHIELD PATTERN
STABILIZER
AIRSPEED INDICATOR
LANDING GEAR
THREAD
THREAD
PANT
AUTHENTIC PLANS
ROBT C. MORRISON. 2/5/35



Picture number ONE

Picture number TWO

Airplane Observers Contest

$50.00 in Cash Awards Will Be Given to Readers Who Name These Planes Correctly

HOW well do you know your airplanes? Here is your chance to show how expert you are in spotting the various makes and types of ships. You will not only find it a fascinating pastime to name these ships, but highly instructive. Many of our aviation experts have started their careers by participating in some minor activity of a similar nature. Here is YOUR chance. Why not start now? It is easy! This is all you have to do:

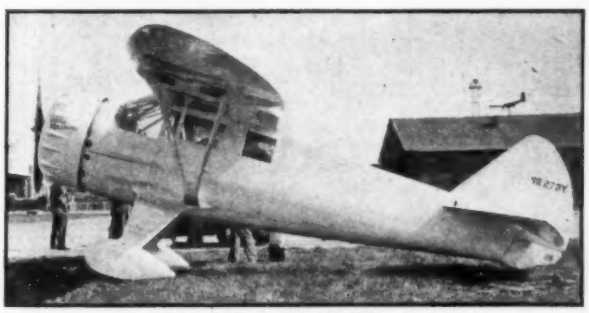
In the box in the center column you will see the names of five of the airplanes pictured on this page. Write these five names after the *correct picture number on the coupon at the bottom of the page*. Put the name corresponding to picture No. 1 on line No. 1; the name for picture No. 2 on line No. 2, etc. There will be one picture left without a name after you have placed the five names after five picture numbers.

Burnelli Transport X14740
Curtiss Hawk BF2C-1
Vought SU-1
Boeing F4B-4
Ford Trimotor 5D

Write the correct name of the remaining airplane after its number on the coupon. When you name the unknown plane, be sure you give the complete name and model number. Only entries with complete names given will be eligible for the awards. For instance, merely, "Curtiss Hawk", is not correct. The correct form is, "Curtiss Hawk P6-E".

Finally print your name and address clearly on the coupon in the spaces allowed. Neatness and simplicity count. Cut or tear

(Continued on page 40)



Picture number THREE

Picture number FOUR

Picture number FIVE

Picture number SIX

No. 1..... No. 4.....

No. 2..... No. 5.....

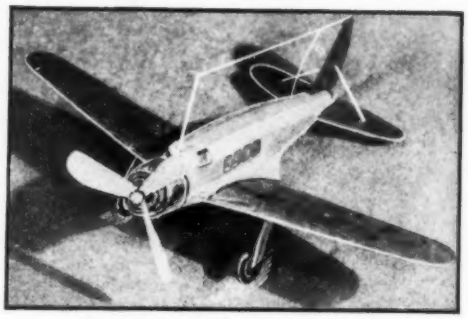
No. 3..... No. 6.....

Name ..... Address .....
(Print Plainly)

Building the Vultee Transport

Complete Data Which Will Enable You to Build and Fly the World's Fastest Transport

By WILLIAM WINTER and WALTER McBRIDE



The finished model is very realistic

JIMMY DOOLITTLE recently flew from Los Angeles to New York, breaking the transcontinental record for transport planes. The plane he used to accomplish this remarkable feat was a Vultee nine-place, all-metal transport of exceptionally clean lines. Also this ship has proven itself, through its fast airline service, to be one of our best transports. Its high speed is in excess of 225 miles per hour.

The model described here is a faithful fast flying copy of its capable prototype. Its construction is simple for this type of ship and insures a rugged, sure flier. You will enjoy building and flying it.

Fuselage

The bulkheads are cut to their respective sizes as illustrated on the plan from 1/16" sheet balsa, and notches made to receive stringers. Cement the four main stringers to bulkheads 2, 3, 4 and 5. When dry fasten bulkhead 8 in place. It may be found necessary to slightly squeeze these stringers to facilitate easy bending. The remainder of the bulkheads may now be glued in place. When dry all stringers may be located. The rear edge of the wing fillet is a piece of 1/16" sheet balsa extending from the outer extremity of bulkhead 5 to bulkhead 6, as shown on the plan. The fillet rib (same as No. 1 wing rib) is cut from 1/16" sheet and cemented to bulkheads as shown. Nose block A is cut from a block 1 11/16" square and glued to front of fuselage. The pilot's enclosure is made from 1/32" sheet as seen on top view. Construct windows as shown on side view. The rear hook of .020 music wire is bent to shape and fastened to bulkhead 8. (Cross grain.) The rear plug and dummy tail wheel are shaped from a soft balsa block and completed unit attached to fuselage.

To cover, use thin strips of Jap tissue (full length of fuselage) and apply with clear dope. The wing fillets are also covered with small pieces of tissue to avoid wrinkles. The finished covering may be lightly sprayed and doped. The windows are of cellophane. Window edges may be trimmed with black dope.

Tail Surfaces

Pin the main spars of 1/16" square on the plan, cut all cross pieces to correct sizes and cement in place. The edges are of 1/16" square balsa sanded to shape. On sharp curves 1/16" sheet balsa is used. Each side of stabilizer and rudder is covered with separate pieces of tissue. The finished covering is lightly doped. The completed surfaces are glued in position on the designated stringers. Bamboo struts 1/32" are fastened to stabilizer and rudder to insure their alignment.

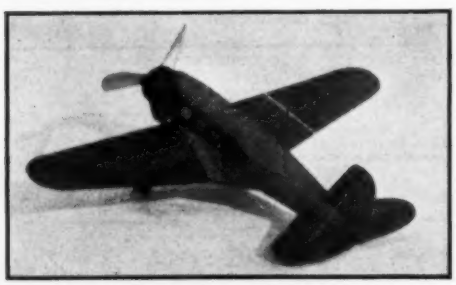
Here it is in full flight. It gains altitude quickly as you can see

Wings

The ribs are cut from 1/16" sheet (soft) to correct sizes. The lower spar of 1/16" square is pinned to the drawing and the ribs cemented in position. Slant rib No. 1 to allow for dihedral. When dry locate the top spar of 1/16" square. The leading edge of 3/32" square is sanded to shape and glued in place. The trailing edge of 1/16" x 3/32" is also sanded to shape. Due to the shape of the ribs, it will be necessary to support the rear edge with small blocks while in the form. The wing tips are cut to shape from 1/16" sheet.

A separate piece of tissue is used to cover both the upper and lower surface of the wing. Take care that the edges of the wing are completely covered so that the wood does not show through. The finished wing is lightly sprayed and doped.

The completed panels are cemented flush to the wing fillets.



A "job" that you can be proud of

Landing Gear

The landing gear struts are cut to the correct shape from 1/16" sheet. Mount the wheel on a piece of .020 music wire, bend axle to shape and glue to landing gear strut as shown on detail. The strut is attached to No. 2 rib as shown on the side view. The axles are slanted rearward and cemented to No. 1 rib to absorb landing shock.

Propeller and Cowling

The three blocks 3"x1"x½" are cut to shape shown and cemented together at the hub. It is necessary to pin the blocks to bench to insure a firm setting. Small wedge shape pieces of balsa are glued between the blades at the hub. When dry the blades may be carved in the usual manner.

To balance, point one blade directly downward. Whichever of the other blades descend should be lightened. Balance other blades similarly. It may be necessary to repeat the operation to insure good balance.

Mount propeller on shaft of .020 wire but do not bend hook as yet. Glue ⅛" washer to rear of hub and place another loosely on the shaft for friction.

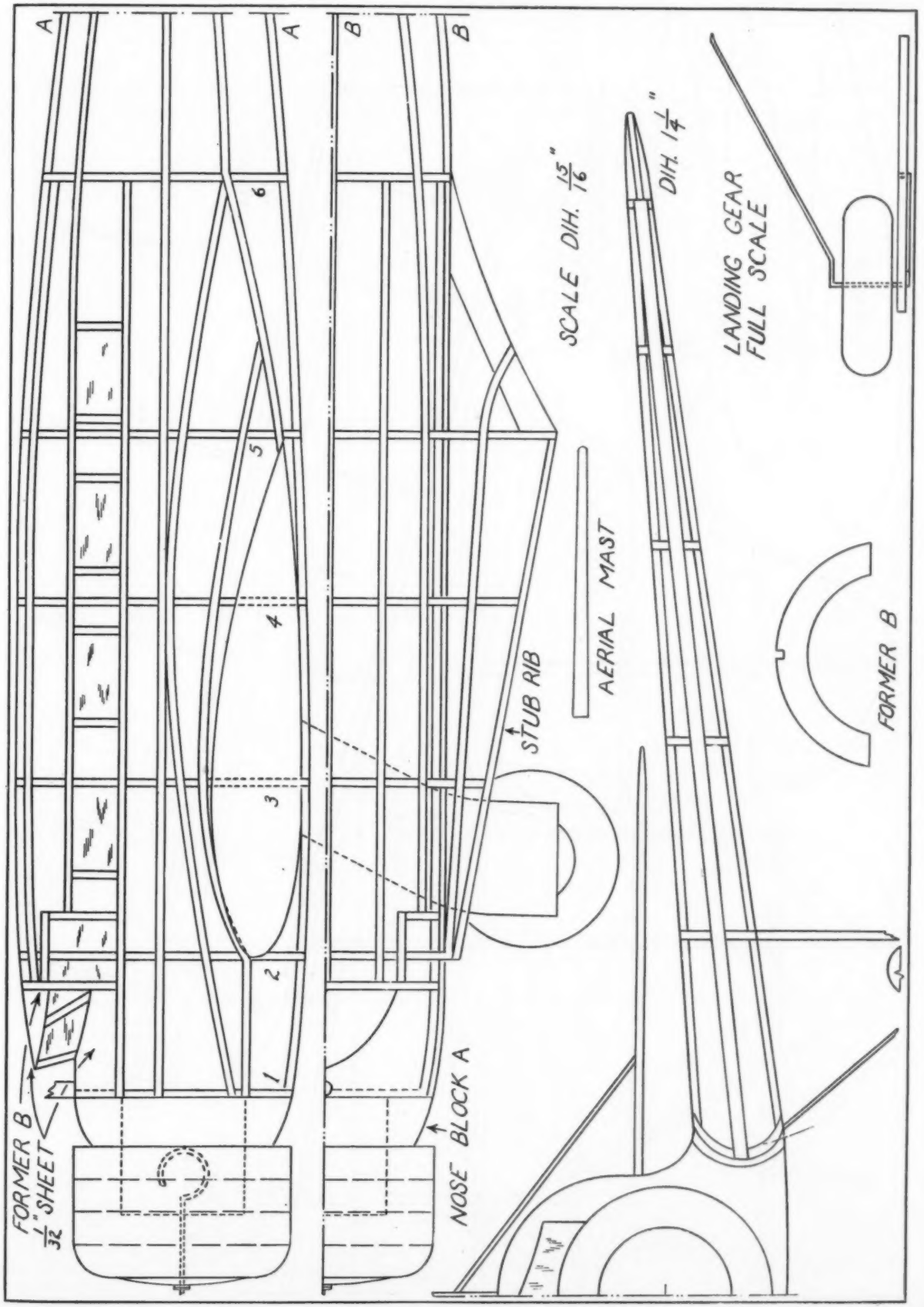
The cowling is glued up of circular pieces 1 11/16" in diameter by ¼" thick and shaped as shown on the side view. The rear of the cowling is cut out as designated by dotted lines. Drill hole for shaft and glue ⅛" washer to front of cowling for thrust bearing. Place finished cowling on shaft and bend hook.

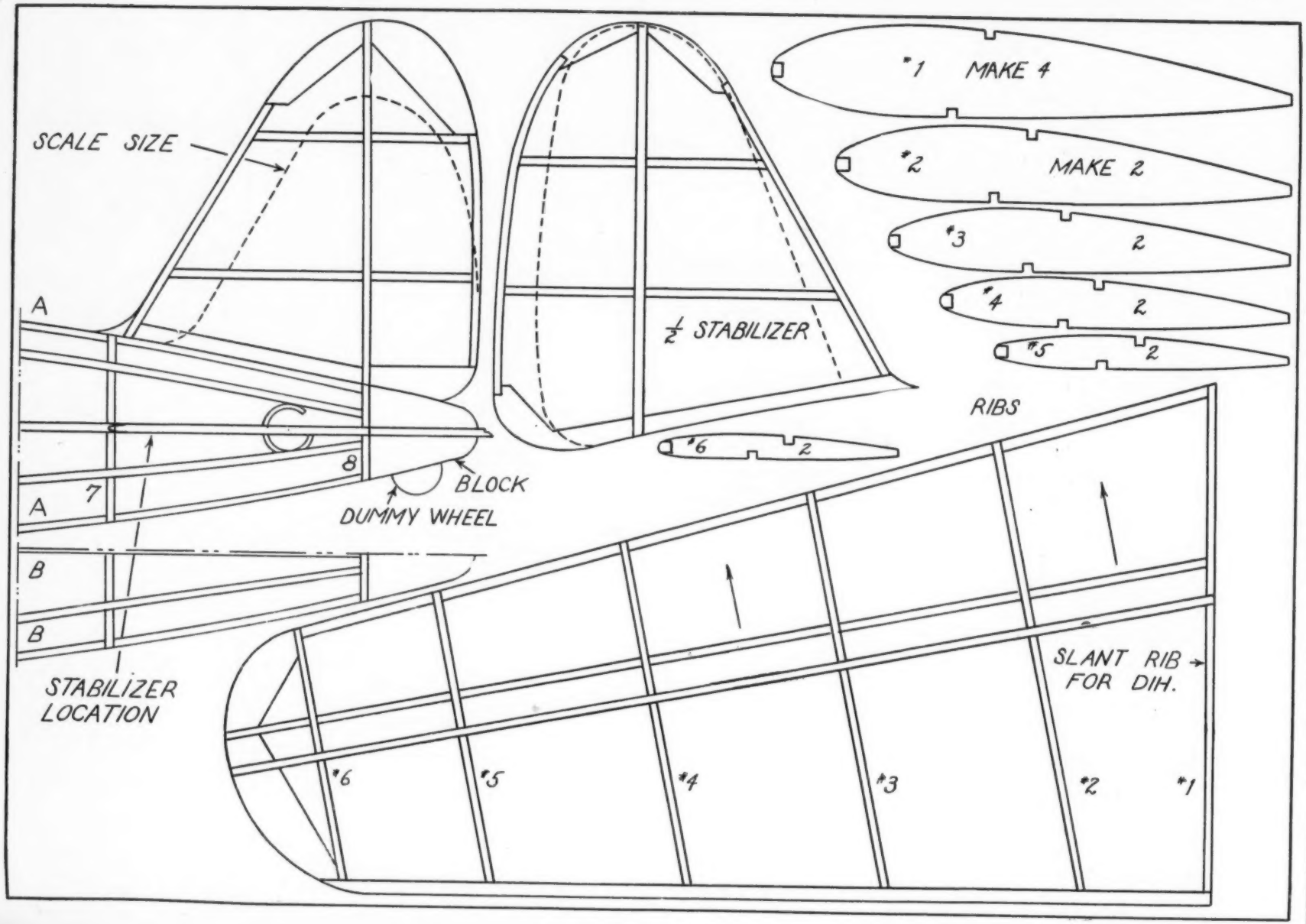
The motive power is four strands of ⅛" flat rubber. If more power is necessary, add a loop of thread rubber.

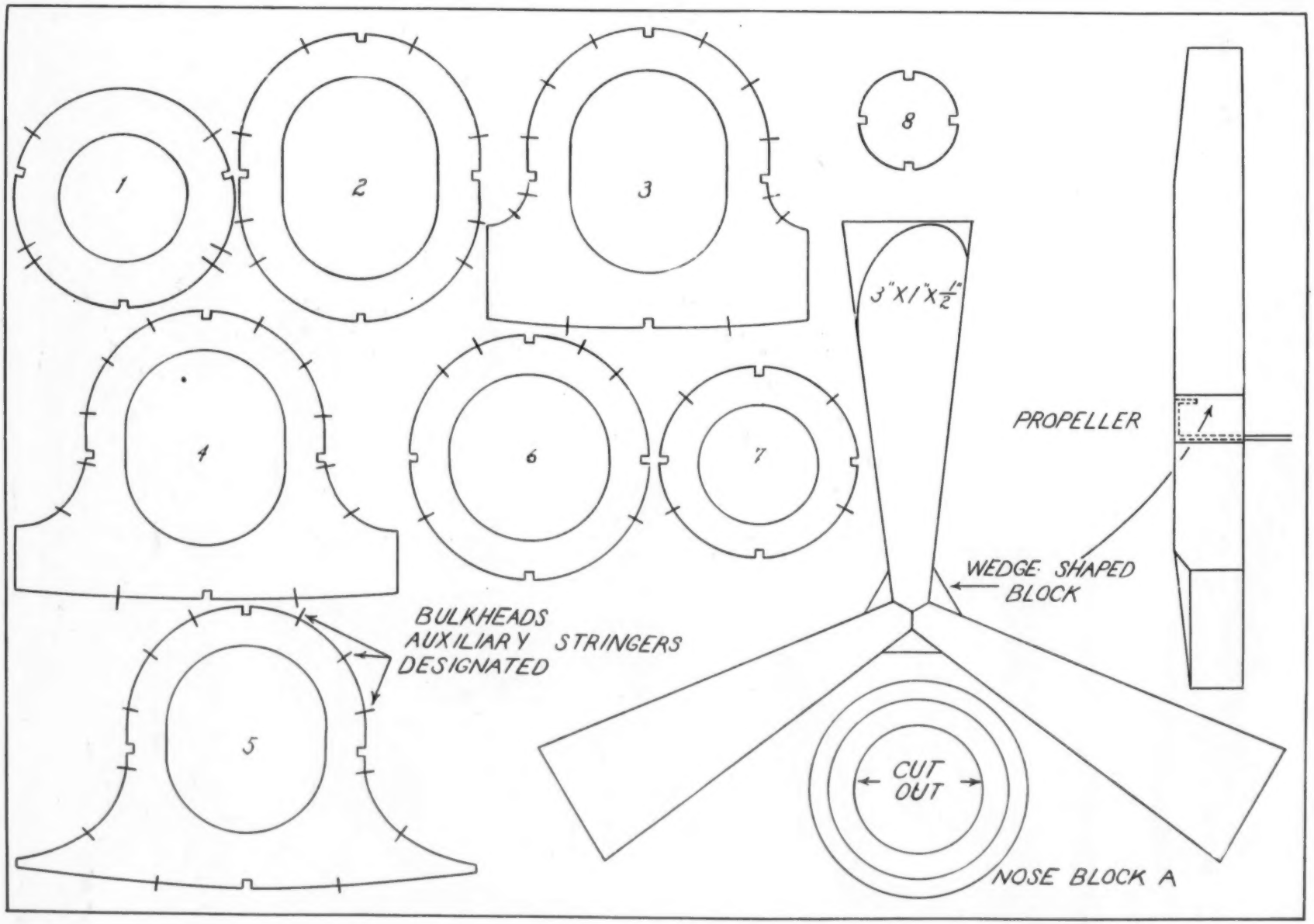
Flying the Model

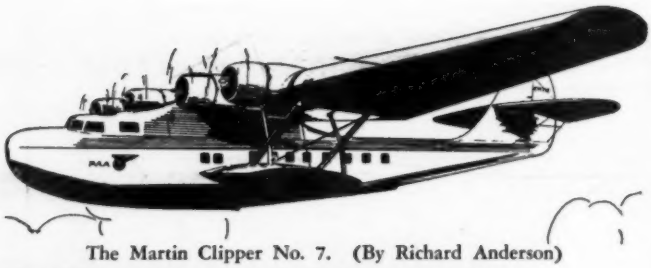
Test the model R.O.G. with a few turns at first. The plane may be slightly tail heavy. If so, add a small weight to the nose. If the plane is found to turn toward the left in flight, it should be permitted to do so. If it banks too steeply

(Continued on page 40)


A
A
B
B
6
5
4
3
2
1
SCALE DIH. 15/16"
DIH. 1/4"
LANDING GEAR
FULL SCALE
STUB RIB
AERIAL MAST
FORMER B
FORMER B
1/32" SHEET
NOSE BLOCK A


SCALE SIZE
A
A
B
B
7
8
C
BLOCK
DUMMY WHEEL
STABILIZER LOCATION
½ STABILIZER
#6 2
#1 MAKE 4
#2 MAKE 2
#3 2
#4 2
#5 2
RIBS
SLANT RIB FOR DIH.
#6
#5
#4
#3
#2
#1

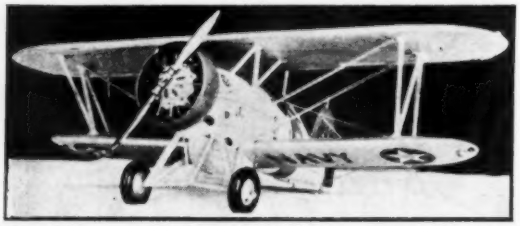

1
2
3
8
4
6
7
5
3"X1"X1/2"
PROPELLER
WEDGE SHAPED BLOCK
BULKHEADS
AUXILIARY STRINGERS
DESIGNATED
CUT OUT
NOSE BLOCK A



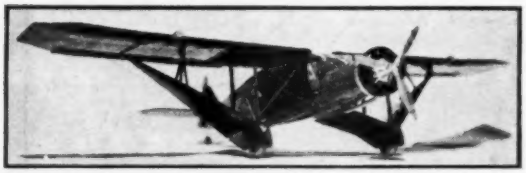
The Martin Clipper No. 7. (By Richard Anderson)

AIR WAYS
HERE AND THERE

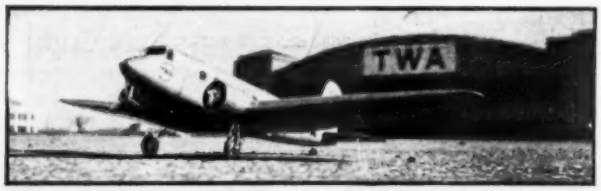
What Readers Are Doing to Increase Their Knowledge of Aviation in All Parts of the World. Send Pictures and Details of Your Experiments



Pict. No. 1. A Boeing F4B-4 which won first place for Ed Mackay at a recent contest. It is complete to the last detail



Pict. No. 2. A very neat detail scale Bellanca Air Cruiser built by Kris Moon. It even has hinges on the cabin doors



Pict. No. 3. A Douglas Airliner "coming in"? No! Just a model cleverly posed and constructed by Robert File. The detail is perfect

THIS column has proven to be a wonderful record of achievement. While browsing through the Air Ways department of the past three years, great improvement in model building as well as the scope of our young aeronauts, was evident. We wonder if you young men realize the extent that aviation has advanced in the last seven years? If you wish to obtain this information, we suggest that you glance through the Air Ways department of some of your back issues.

As our heading for this issue we have a clever drawing made by Richard A. Anderson of 122 Emery Street, Portland, Maine, of the new Martin Clipper Ship No. 7. It is America's largest flying boat. We wish to extend our appreciation to Mr. Anderson for this drawing.

A contest was recently held at Berwyn, Illinois, sponsored by the Lewis Model Aircraft Company. The winning model is shown in picture No. 1. It is a Boeing F4B-4, built by Ed Mackay of 1427 South 58th Court, Cicero, Illinois. Mackay is only fifteen years old. One cannot help but wonder how expert he will be at fifty, if he has made the progress demonstrated here in approximately two or three years. The model is complete down to the last detail. The detail of the engine and the propeller suggests the care with which this model was built throughout.

There are some people who still think that model building is child's play. It appears that they think this because of their lack of contact with models and model builders. At one time this possibly was true, where model planes were something to play with. However, today it has become a medium which promotes the serious study of aeronautics. More and more adults are taking it up as an instructive pastime. It seems that Kris H. Moon of 10144-90th Street, Edmonton, Alberta, Canada, is such a person. He has his private pilot's license and has started carrying passengers. However, he finds time to build models. Picture No. 2 shows a built-up scale Bellanca Air Cruiser which he recently completed. It is made in great detail. There are seats in the cabin and in the pilots' compartment, control column and instrument panel, pitot tube, etc. The controls are all movable and the doors open on hinges. The motor is built up of approximately 150 pieces. It has rocker arms, push rods, etc.

Anyone who attended the National Model Contest held in Akron, Ohio, last year will probably know Bob File of 502 Seymour

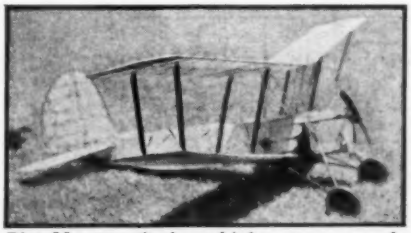
Pict. No. 4. John Sokol's miniature airport with his fleet of planes; something to be proud of

Pict. No. 9. Model builders at one of the more progressive summer camps. (Courtesy of Everett Carleton, Jr.)

Pict. No. 5. Gerard Smith who builds gas-powered ships that win first place. This is one

Pict. No. 6. This is not a fleet of war planes "at the front" in 1916, but a fine collection owned by G. B. Jarrett and hangared at his farm

Avenue, Columbus, Ohio. Readers of the magazine will also recall that we recently presented plans of his glider, which holds the official world's record. It appears that he has fallen from his high place to revert to trick photography. However, we must say that it is one of the finest pieces of trick photography we have even seen. We are talking about picture No. 3, which shows his model Douglas Transport posed in front of a full-size hangar at an actual airport. We defy anyone to detect the fact that this is merely a model and not a real ship.



Pict. No. 13. A clever biplane gas-powered model by Bill Appleton of England

Pict. No. 15. The Centinella Model Aircraft Club during a contest. Miss Richards is a consistent winner

It appears that the secret of obtaining realistic shots of this nature is to place the camera directly upon the ground. Doing this enlarges objects in the foreground and causes objects in the background to appear very distant and small.

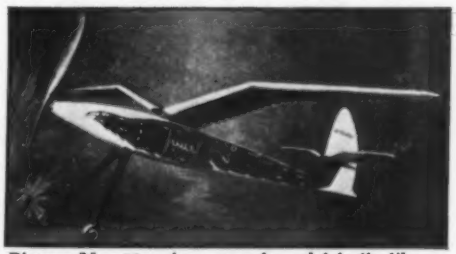
It looks as if John Sokol of 2020 Kenneth Avenue, Arnold, Pa., is going to be an airport builder, manager, or something of the kind. He is extremely interested in building airports equipped with accurate detail scale models. Picture No. 4 shows a miniature airport which is set up in his shop. Though the planes appear quite small in this picture, it can be seen that the workmanship is excellent and details have been faithfully carried out. The dollar bill in the background will give you some idea as to the actual size of the planes. The ships in the picture include Curtiss Hawks, Seversky, a Howard Ike, a Polish Fighter, a Northrop Gamma, a Fairchild and a Goshawk in the rear, which is camouflaged. In fact it is quite difficult to see this plane unless you look at it for a minute or so. A wartime Spad and Nieuport also enjoy the company of the modern ships mentioned.

Picture No. 5 shows Gerard L. Smith of 398 7th Avenue, Brooklyn, New York, with his eight foot gas powered job, which enabled him to take first prize at the Caldwell Gas Meet some time ago. Smith is an enthusiastic gas model fan and has grasped the art of making remarkable flights with unusual ease. He expects to be a strong contender for the trophies to be presented in coming contests.

Have any of you readers ever been to Atlantic City? If not, do not fail to see the interesting exhibit at the Jarrett Museum. Mr. Jarrett will welcome any model fans, as he is an enthusiastic aviation fan himself. He has made an unusual collection of World War planes, probably the finest one in the world. Picture No. 6 is not a lineup on the "front" during the War, but some of the ships at Mr. Jarrett's farm, where he has them quartered. In the right foreground you will notice a Spad, not a battered and broken relic, but a trim-looking ship. His collection includes a Fokker Triplane, an S.E. 5, an Albatros and several other makes.

Pict. No. 12. The New Plymouth Model Airplane Club of New Zealand after a contest. (Courtesy F. J. Brown, Sec'y)

We hear again from John B. Hastings, of 311 North 8th Street, St. Joseph, Missouri. This time, however, he presents the work of his good friend, Charles Dahlenburg of 2227 Marion Street. Evidently Dahlenburg himself is very modest. However, he has no right to be, for his twelve inch Sikorsky S-11, a scale model, shown in picture No. 7, is a remarkable piece of work. When this picture was received, it gave the impression of an extremely large model because of the careful detail embodied in its structure. Hastings says that this is Dahlenburg's first solid scale model. He has been a flying model fan but no matter what he makes, it is always good. We have great hopes for the future of aviation with young men like Dahlenburg rising to positions of authority in aviation.

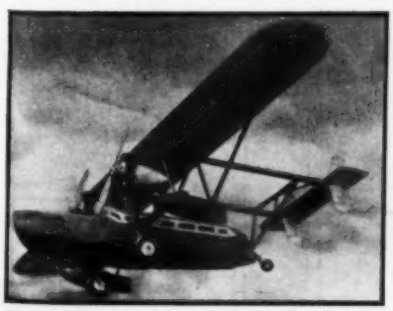


Picture No. 10. An unusual model built like a soaring glider, by Glen Rymer

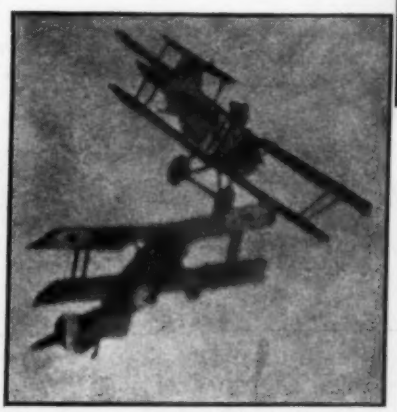
Martin Littmann of 5429 Madison Road, Cincinnati, Ohio, has been following the course, "Fundamentals of Model Airplane Building". One of his ships, model No. 5, which he built from plans in this series

(Continued on page 45)

Pict. No. 14. A group of winners and judges at the recent Bamberger Contest

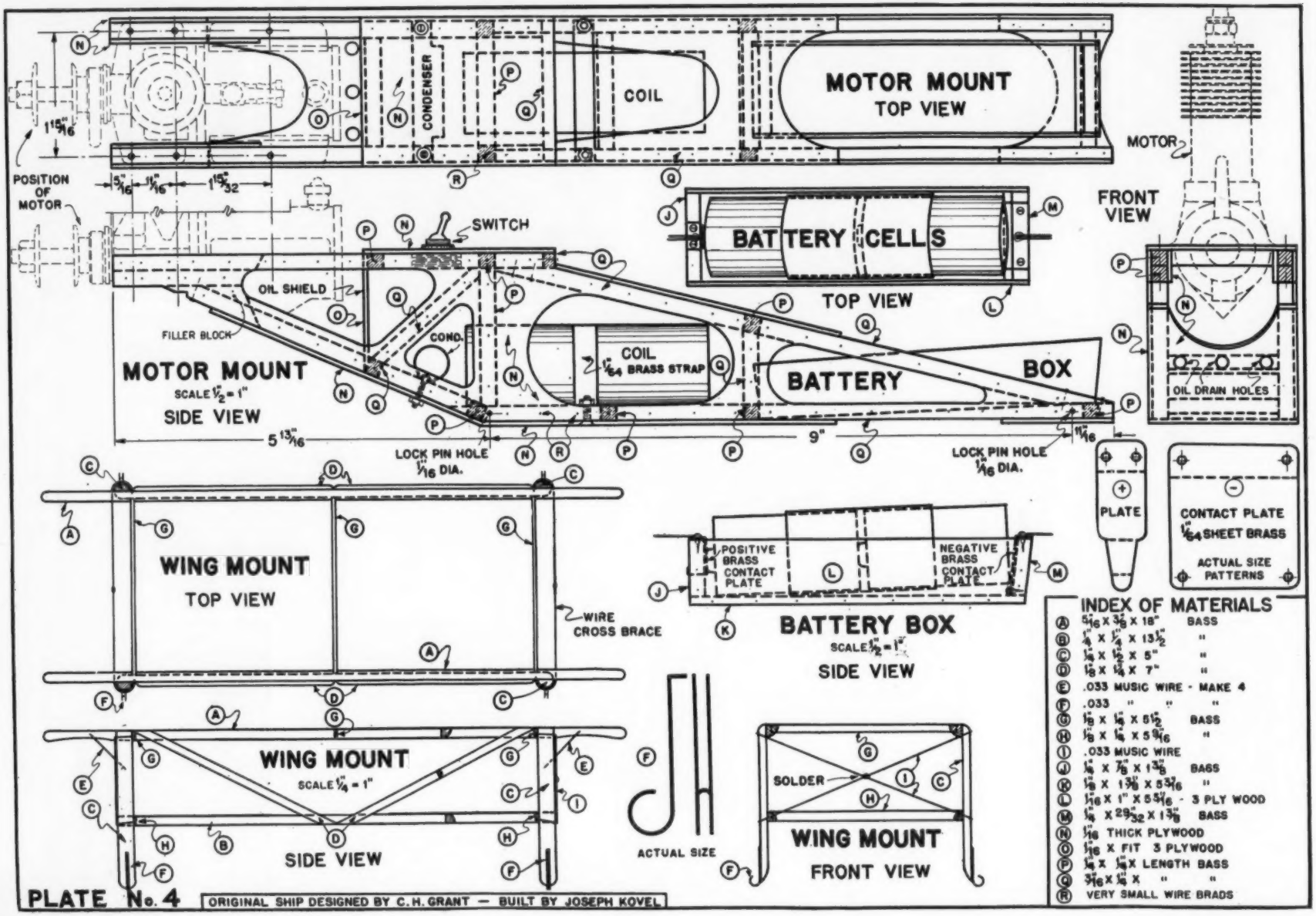


Pict. No. 7. A beautifully made 12 inch Sikorsky S-11, by Charles Dahlenburg



Pict. No. 11. A dog fight in the clouds staged by E. R. Battye with two of his models

Pict. No. 8. A model by Martin Littmann that rights itself when launched upside down



INDEX OF MATERIALS

(A)	5/16 X 3/8 X 18" BASS
(B)	1/4 X 1/4 X 13 1/2" "
(C)	1/8 X 1/2 X 5" "
(D)	1/8 X 1/4 X 7" "
(E)	.033 MUSIC WIRE - MAKE 4
(F)	.033 " " "
(G)	1/8 X 1/4 X 5 1/2 BASS
(H)	1/8 X 1/4 X 5 9/16 "
(I)	.033 MUSIC WIRE
(J)	1/8 X 7/8 X 1 3/8 BASS
(K)	1/8 X 1 3/8 X 5 3/16 "
(L)	1/16 X 1" X 5 3/16 - 3 PLY WOOD
(M)	1/8 X 29/32 X 1 3/8 BASS
(N)	1/16 THICK PLYWOOD
(O)	1/16 X FIT 3 PLYWOOD
(P)	1/4 X 1/8 X LENGTH BASS
(Q)	3/16 X 1/8 X " "
(R)	VERY SMALL WIRE BRADS

PLATE No. 4 ORIGINAL SHIP DESIGNED BY C. H. GRANT — BUILT BY JOSEPH KOVEL

How to Build A Reliable Gas Engine Model

How You Can Complete an Eight Foot Miniature Airplane That Has Proved to Be An Unusually Steady Flyer—Part No. 2

The little ship, unharmed after landing in a forest

By JOSEPH KOVEL

IN THE preceding issue of MODEL AIRPLANE NEWS, we published the first part of this article, in which we gave you full instructions and plans to build a miniature gasoline engine model.

This little ship is a very remarkable and stable flier. Its stability, in fact, is most unusual. On many occasions it has been taken for a real ship while it has been in the air because of its steadiness in flight.

If you have not read the first half of this article and are interested in building this ship, we suggest that you read the first part, appearing in the April issue before reading this article through.

You readers who have undertaken the construction of this ship may continue by following the instructions and the plans given here. Continue where we left off in part one. Your next procedure is to build the motor-mount.

Motor-Mount (Plate 4)

The motor-mount is made for the Brown Jr. engine, or an engine whose mounting holes are similarly spaced. If you are going to use an engine whose mounting holes are wider apart, you will have to make the motor-mount wider and build your Stations One and Three fuselage bulkheads to receive the wider mount.

Draw one side of the motor-mount on a sheet of 1/16" three-ply birch wood, including the various struts and lightening holes. Cut this side out of the plywood sheet, and, using it as a pattern, mark out the other side. When you have both of the sides accurately cut out, you may start nailing and gluing the struts into place. (Use Casco glue and the smallest wire brads you can get. If the brads you buy are not small enough, you may clip off the excess lengths with a pair of wire snips.) Be sure to make one right side and one left side of the motor-mount, and don't forget to attach the tie plates on the inner sides of the front end. When you have made both sides, it is advisable that you set them aside to dry overnight. (In the meanwhile, you can get busy on something else.) When the cement joints have hardened properly, cut out the lightening holes, then assemble the sides as shown in top view. Take care to line the sides up properly. First nail and glue the oil shield "O" into place, then do likewise to the top and bottom plywood plates. When the cement joints have hardened, cut out the top and bottom lightening holes. Give the motor-mount three coats of shellac, allowing plenty of time for each coat to dry. Drill 3/32" dia. holes wherever specified for mounting the motor, gas tank, condenser and coil. Cut out a hole in the top panel for mounting the switch, as shown in side view.

Off for a flight of 23 minutes. It is as steady as a big ship

Battery Box (Plate 4)

You will have to be very accurate in constructing the battery box, as the battery cells have to wedge in tightly in order for the box to be effective. You will notice on the plan that the negative terminal is set at a slight angle. The negative end of the battery cells should rest in the position shown when it is wedged and tied with rubber bands into place. If you make the box too long, you will not get an efficient contact, whereas if the box is too short, the battery will sit too high in the air.

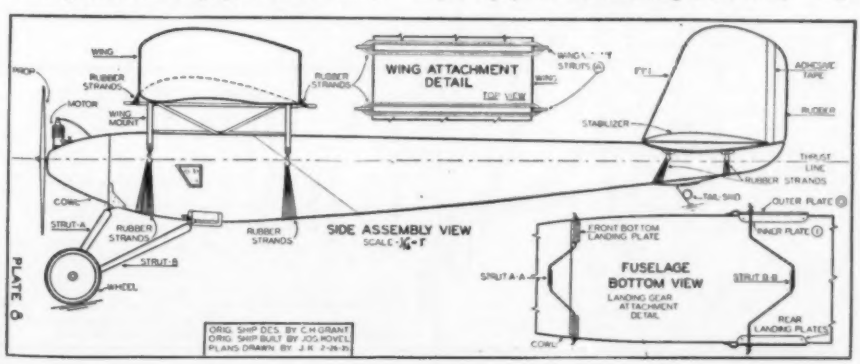
Cut the terminal plates "J" and "M" to size, then make the positive and negative contact plates. Anchor these plates to the terminal plates "J" and "M", using 1/16" x 3/8" wood screws as shown on plan. Cut the bottom piece "K" to size, then nail and glue (Casco Glue) it to terminal plates "J" and "M". Make the sides "L" out of plywood, then anchor them into position. Solder a length of well insulated wire to each contact plate, then give the battery box about three coats of shellac, allowing time for each coat to dry. When the shellac has dried, screw the box to the motor-mount in the position shown on plan. Wire the ignition system as per the instructions you receive with the engine. Drill the front lock-pin holes as shown in side view. (The rear holes are drilled after the fuselage frame is finished, and adjusted to anchor the motor-mount properly.)

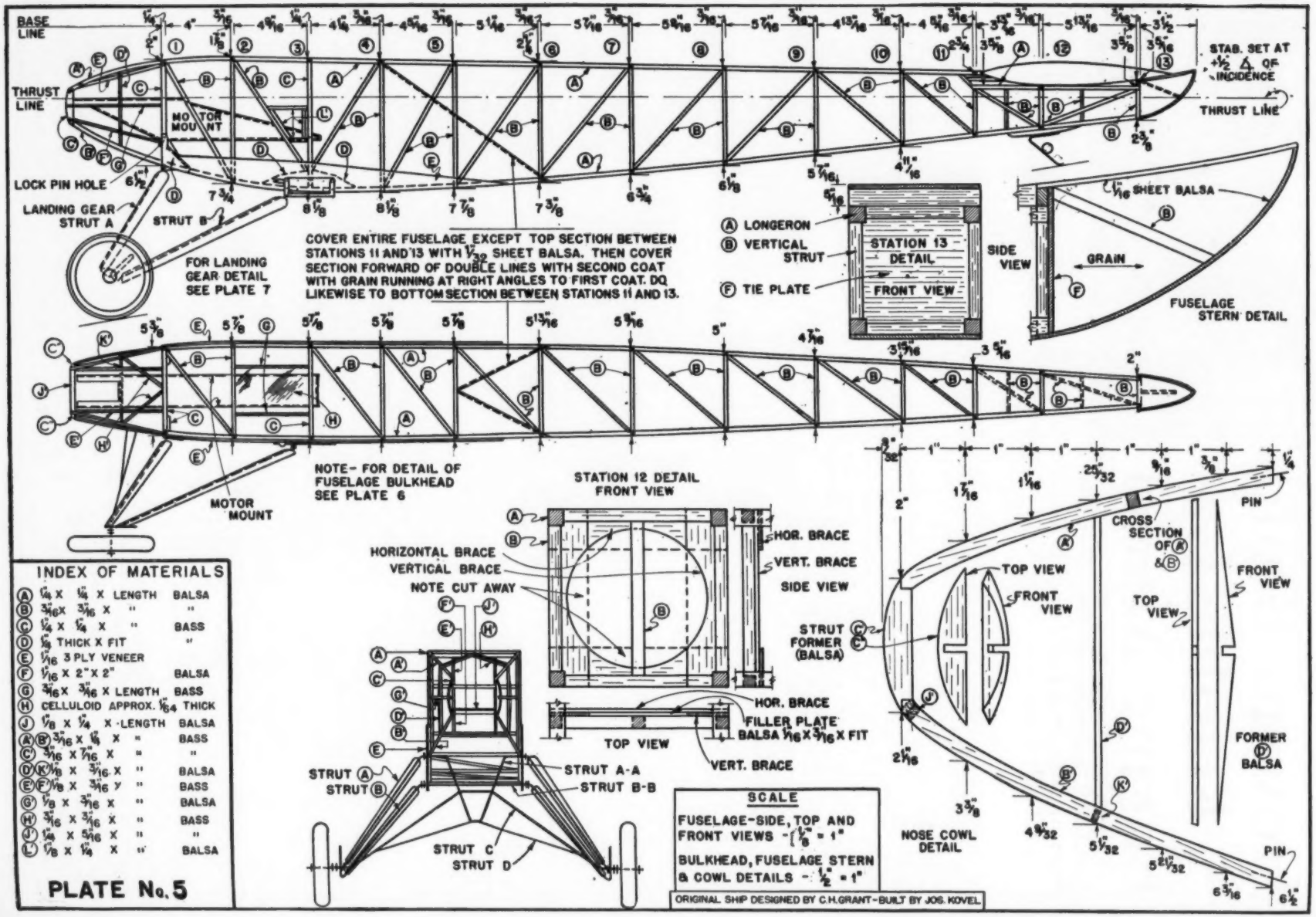
Propeller (Plate 6)

The propeller should be carved out of either basswood or hickory. Bass is given first choice, as in the event of a crack-up, or something hitting the prop while the engine is running, the bass prop will break easily and minimize any possible damage to the prop shaft. However, hickory also has its good points and runs basswood a close second in choice of woods for propellers.

Mark out the prop blank by drawing a ¼" dia. circle, through which the shaft dole is to be drilled, then draw a 1 1/16" dia. circle. Draw the diagonals across the face of the block, then the hub as shown in top view. Cut the blank out, then draw lines on each blade 1⅛" from the center of the blank. Taper each blade from ½" at the lines you have just drawn, to ⅜" at the

(Continued on page 34)





INDEX OF MATERIALS

(A)	1/4 X 1/4 X LENGTH	BALSA
(B)	3/16 X 3/16 X "	"
(C)	1/4 X 1/4 X "	BASS
(D)	1/8 THICK X FIT	"
(E)	1/16 3 PLY VENEER	
(F)	1/16 X 2" X 2"	BALSA
(G)	3/16 X 3/16 X LENGTH	BASS
(H)	CELLULOID APPROX. 1/64 THICK	
(J)	1/8 X 1/4 X LENGTH	BALSA
(A)(B)	3/16 X 1/4 X "	BASS
(C)	3/16 X 7/16 X "	"
(D)(K)	1/8 X 3/16 X "	BALSA
(E)(F)	1/8 X 3/16 X "	BASS
(G)	1/8 X 3/16 X "	BALSA
(H)	3/16 X 3/16 X "	BASS
(J)	1/8 X 5/16 X "	"
(L)	1/8 X 1/4 X "	BALSA

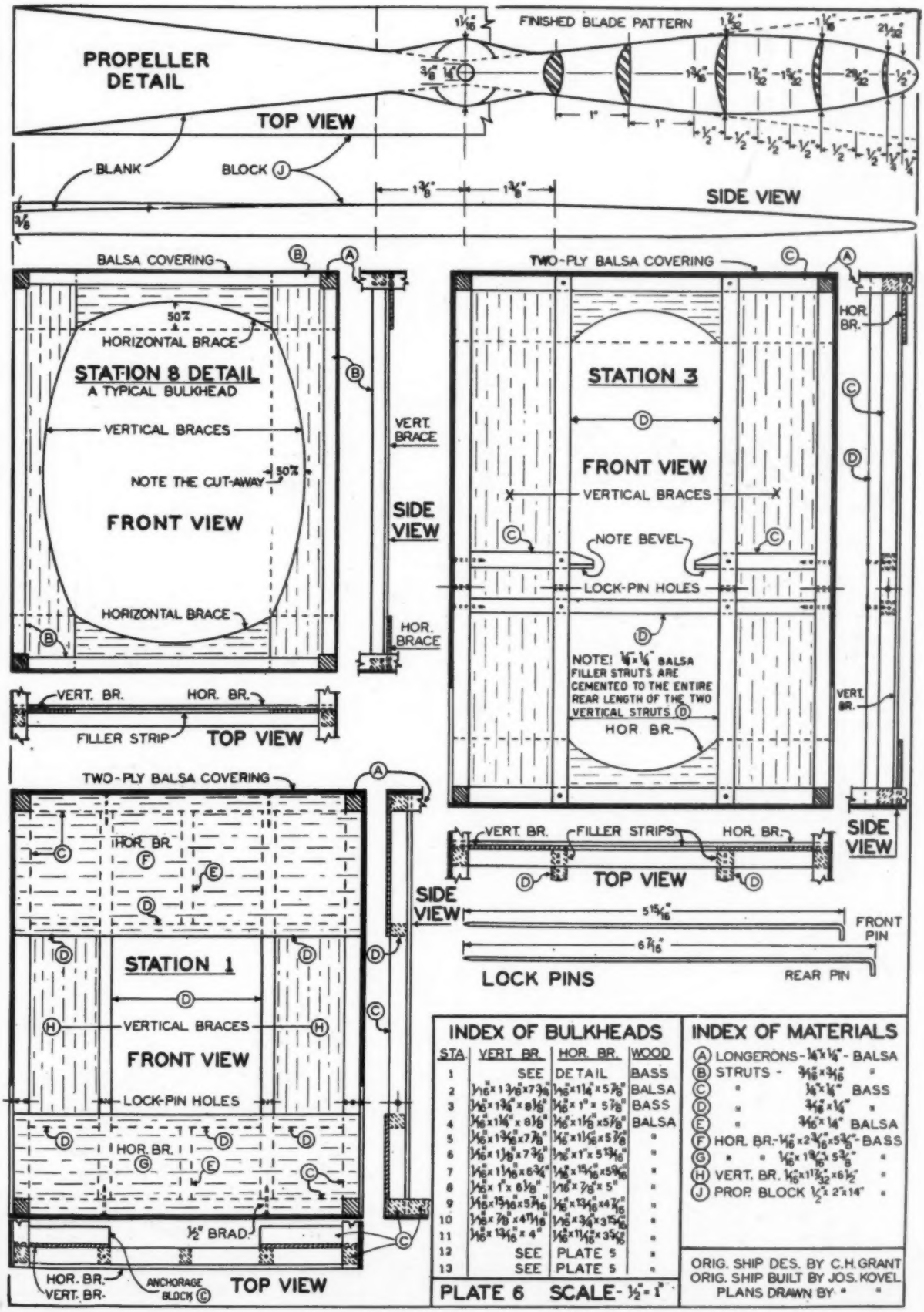
PLATE No. 5

SCALE

FUSELAGE-SIDE, TOP AND FRONT VIEWS - 1/8" = 1"

BULKHEAD, FUSELAGE STERN & COWL DETAILS - 1/2" = 1"

ORIGINAL SHIP DESIGNED BY C.H.GRANT-BUILT BY JOS. KOVEL



INDEX OF BULKHEADS

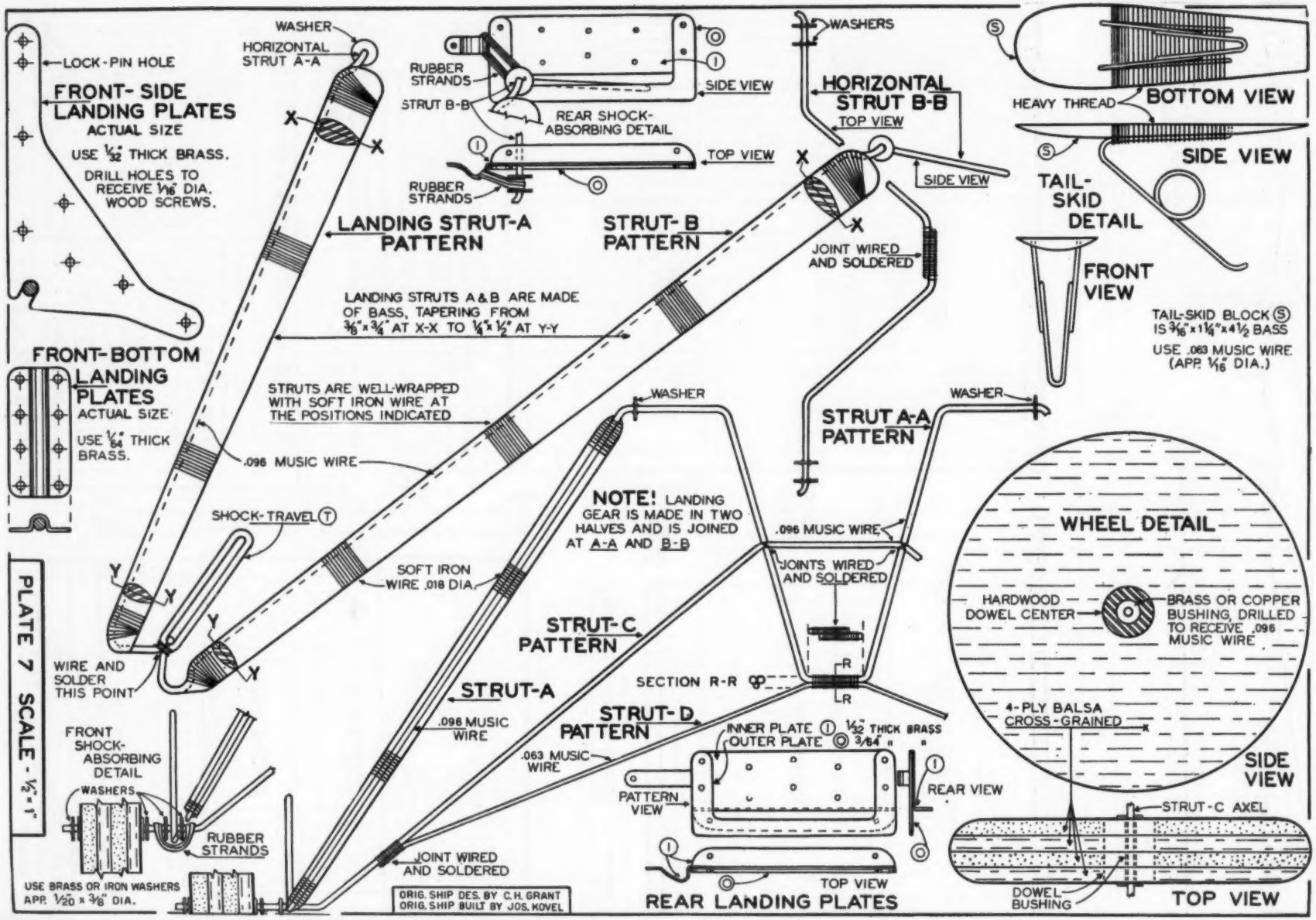
STA.	VERT. BR.	HOR. BR.	WOOD
1	SEE	DETAIL	BASS
2	1/16" x 1 3/16" x 7 3/16"	1/16" x 1 1/4" x 5 7/8"	BALSA
3	1/16" x 1 3/16" x 8 1/8"	1/16" x 1" x 5 7/8"	BASS
4	1/16" x 1 1/4" x 8 1/8"	1/16" x 1 1/8" x 5 7/8"	BALSA
5	1/16" x 1 3/16" x 7 7/8"	1/16" x 1 1/16" x 5 7/8"	"
6	1/16" x 1 1/8" x 7 3/8"	1/16" x 1" x 5 13/16"	"
7	1/16" x 1 1/8" x 6 3/4"	1/16" x 15/16" x 5 9/16"	"
8	1/16" x 1" x 6 1/8"	1/16" x 7/8" x 5"	"
9	1/16" x 15/16" x 5 7/16"	1/16" x 13/16" x 4 7/16"	"
10	1/16" x 7/8" x 4 11/16"	1/16" x 3/4" x 3 15/16"	"
11	1/16" x 13/16" x 4"	1/16" x 11/16" x 3 5/16"	"
12	SEE	PLATE 5	"
13	SEE	PLATE 5	"

PLATE 6 SCALE- 1/2" = 1"

INDEX OF MATERIALS

(A) LONGERONS - 1/4" x 1/2" - BALSA
(B) STRUTS - 3/16" x 3/16" "
(C) " 1/4" x 1/4" BASS
(D) " 3/16" x 1/4" "
(E) " 3/16" x 1/4" BALSA
(F) HOR. BR. - 1/16" x 2 3/16" x 5 3/8" - BASS
(G) " " 1/16" x 1 9/16" x 5 3/8" "
(H) VERT. BR. 1/16" x 1 1/32" x 6 1/2" "
(J) PROP. BLOCK 1/2" x 2" x 14" "

ORIG. SHIP DES. BY C.H. GRANT
ORIG. SHIP BUILT BY JOS. KOVEL
PLANS DRAWN BY: " "


LOCK-PIN HOLE
FRONT-SIDE LANDING PLATES
ACTUAL SIZE
USE 1/32" THICK BRASS.
DRILL HOLES TO RECEIVE 1/16" DIA. WOOD SCREWS.
FRONT-BOTTOM LANDING PLATES
ACTUAL SIZE
USE 1/64" THICK BRASS.
WASHER
HORIZONTAL STRUT A-A
RUBBER STRANDS
STRUT B-B
SIDE VIEW
REAR SHOCK-ABSORBING DETAIL
TOP VIEW
RUBBER STRANDS
LANDING STRUT-A PATTERN
STRUT-B PATTERN
WASHERS
HORIZONTAL STRUT B-B
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SIDE VIEW
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STRUTS ARE WELL-WRAPPED WITH SOFT IRON WIRE AT THE POSITIONS INDICATED
.096 MUSIC WIRE
SHOCK-TRAVEL (T)
SOFT IRON WIRE .018 DIA.
WIRE AND SOLDER THIS POINT
WASHER
WASHER
STRUT A-A PATTERN
NOTE! LANDING GEAR IS MADE IN TWO HALVES AND IS JOINED AT A-A AND B-B
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JOINTS WIRED AND SOLDERED
STRUT-C PATTERN
SECTION R-R
R
R
STRUT-A
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.063 MUSIC WIRE
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ORIG. SHIP DES. BY C.H. GRANT
ORIG. SHIP BUILT BY JOS. KOVEL
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DOWEL BUSHING
TOP VIEW
HEAVY THREAD
BOTTOM VIEW
SIDE VIEW
TAIL-SKID DETAIL
FRONT VIEW
TAIL-SKID BLOCK (S) IS 3/16" x 1 1/8" x 4 1/2" BASS
USE .063 MUSIC WIRE (APP. 1/16" DIA.)

The Aerodynamic Design of the Model Plane

Article No. 39

Chapter No. 4

A Comparison of the Energy Output of Lubricated, Stretched and Dry Wound Rubber Motors—Formulae Which Give Values for Torque, Turns and Work

By Charles Hampson Grant

THE formulae given in the preceding article of this series provide an accurate and convenient means of determining the capacity of dry rubber motors of various numbers of strands to deliver torque, turns and work. The graphs printed in previous articles show the values of these factors for motors of two, four, six, eight, ten and in some cases, twelve strands. However, by means of the formulae, values of these factors may be determined for motors of *any number of strands.*

All of the values derived by means of the formulae and the graphs are produced by motors which were wound for the first time when the tests were made, and not *prewound.* Insomuch as most model flying is done with motors that have been wound several times previously, it is necessary to know whether the values of torque, turns and work remain the same for every winding or whether their values are less after repeated windings. If the latter case is true, how much do their values decrease and how can accurate values be determined?

A glance at the tables at the top of page No. 32 of the December issue will reveal the fact that there is considerable drop in the value of torque at any given number of maximum turns indicated. In the case of brown rubber, after three windings, there is a drop of 6¼% in the torque and after six windings a drop of 13.5%.

You will notice that this reduction in torque is recorded at 200 turns in each case. However, after the motor has been wound several times, though the torque drops at the 200 turn mark, it may be wound from 5% to 8% more and during this additional winding the torque rises sharply to a maximum. In fact, the maximum torque, after repeated windings, is nearly as great as at the first winding, due to the rapid rise of the torque curve during the 5% to 8% possible additional winding.

Actually, the drop in the maximum torque is equal to about half the decrease indicated at the given number of turns which happens to be a maximum for a first winding. This means that the drop in the maximum torque after three windings is one-half of 6¼% or 3.4%. After six windings it is 7%.

Therefore, in order to determine accurate values for maximum torque after three windings, by means of the formulae, it is necessary to multiply the result obtained from any torque formulae for an unstretched, dry wound motor by (0.966).

For example, the formula to use in order to determine the torque of a brown rubber motor composed of 1/8"x1/30" rubber strands, after three windings, would be:

$$Q\max = 0.286(\sqrt{N^3}+0.34)(0.966).$$

After six windings brown rubber maximum torque formulae should be multiplied by (0.93).

It is indicated by the fatigue tables just referred to that the motor increases in length after repeated windings. After three windings the motor increases 7% in length. (Brown rubber). Although it is evident that the cross section is made smaller by the amount the length increases, due to the fact that the rubber is compressed to a greater extent after the first winding, a greater number of turns can be stored in a motor after three repeated windings by only about 7%. After six windings it is possible to store 8.2% more turns in a motor.

Thus, after three windings it is necessary to *multiply the result derived from the formulae for possible number of turns by (1.07), and after six windings, by (1.082).*

From this it is evident that *the number of turns possible increases slightly more than the maximum torque decreases.* As the work that can be stored in a motor is proportional to the torque times the possible turns, it can also be seen that the amount of work that can be stored increases *slightly* with repeated windings.

Upon examining the fatigue test table for black rubber, we see that there is a drop of 10% in the torque at any given number of maximum turns indicated after three windings of a motor of this type of rubber. After six windings the torque has been reduced by 16%. This means that the drop in the *maximum* torque is about 5% after three windings and about 8% after six windings.

Thus, in order to determine the maximum torque of black rubber motors after three windings, the formula should be *multiplied by (0.95).* After six windings, multiply the formula by (0.92).

In the case of unstretched, dry black rubber motors the formulae for the *possible number of turns* should be multiplied by (1.05) after three windings and by (1.06) after six windings, or more.

The amount of work that can be stored, after repeated windings, in motors of this type is about the same regardless of the

(Continued on page 38)

Get Your Models Ready for the Eastern States Outdoor Contest

PROBABLY this will be the biggest contest held in the East this year. In fact, it is expected that it will rival the National Contest which will be held in St. Louis in the last part of June. So do not wait to make your models ready for this big event.

The events to be held are as follows:

1. Gas powered Models. (Not over 7 lbs.)

2. Twin Pusher, Class C. (100 to 150 square inches)

3. Fuselage, Class D. (150 to 300 square inches)

4. Catapult Glider, Class C.

A special prize is offered for the best flight made by a gas engine powered Autogiro. There will be no limitations in this event.

Great pains have been taken to obtain the finest location for flying and worth while trophies. Both of these are assured.

The Contest will be held on May 25th, starting at 9 a. m. at Hadley Field, located just five miles north of New Brunswick, New Jersey and two miles south of Dunellen, New Jersey. You can reach the Field from either place by bus which runs on a regular schedule. To go to Dunellen, take the New Jersey Central Railroad. The Pennsylvania will take you to New Brunswick. Those of you who wish to make the trip by auto, should take Route No. 29 to Dunellen and Route No. 27 to New Brunswick. Both roads are concrete. The route to Dunellen is possibly the more direct and quickest.

Send in for your *Registration Blank* immediately. Address your request to Mr. Nathan Polk, Bamberger Aero Club, L. Bamberger & Company, Newark, N. J., or Charles H. Grant, MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City.

Hit the Model Airplane World!

No Kit on this page over 85c

"D Flying Models has Made Modelbuilders Rub Their Eyes and Blink

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ale fly dels for as little as 25c to " scal single one a *flying* mod- cted fo idespread popularity! No night s —sweeping the country— delbuil erywhere—no wonder both ampede ith rush demands. A front f yea leadership modelbuilders veland

detail, and flyability for authentic mod of the features of these "Dwarf" Kits read entirely printed out, including rin tal engines on designs requiring the time jobs and those with NACA cow ful smooth turning for the cowl fro ed, as are all finished wheels in ever pt D-19), nose blocks drilled, and all work completed, only handwork left to b his also includes a beautifully sawn bal nter drilled. All insignia, where nec plied. Absolutely everything in- clu LIQUIDS (and striping tape for liqu id up a beautiful exhibition model, cap d flights, and, by the elimination of n ribs, stringers, etc., considerably ligh greater duration flying qualities.

ly Co t WITHOUT LIQUIDS

VOUGHT CORSAIR V-65

Make either of the new 2-place Corsairs (V-65 or V-80). Super detailed, extremely realistic. Embodies Cleveland features, including new principle gray flying prop. blades. Span 15", length 12¼". Suggested coloring: blue, yellow, red, black and silver. Kit D-41 ..... **85c**

FAMOUS WARTIME FOKKER D-7

A really authentic steady flying beauty so realistic that it looks as though it was drawn right from the ranks of one of the famous German "Flying Circuses." Wings taper beautifully, new feature control movements (not from cockpit), scale propeller, authentic spandau guns (you make all). Suggested coloring: international orange, green, white, black details. Span 14⅛", length 11¼" Kit No. SF-15B **60c**

HOWARD "PETE"

An easy-to-build Air Race model—fine flights. Span 10", length 8⅝". Suggested coloring: all white, black details. Kit D-18B **30c**

HOWARD RACER "IKE"

Information on this design is supplied both as the four or two wheel "Ike" and the two wheeled "Mike." Flies and climbs beautifully. Span 10⅛", length 8½". Suggested coloring: white with black details, lettering. Kit D-42, only **25c**

U.S. ARMY BOEING P-12E

One of the prettiest of all army fighters. An excellent flying model. Span 15", length 10¼". Suggested coloring: yellow and olive drab, with beautiful red and yellow trimmings. Kit D-8C **65c**

GREAT LAKES SPORT TRAINER

of the prettiest dels available. to build. Excel- flights. Includes land's latest es and loads of ils. Span 13⅜", th 10⅛". Sug- ed coloring: or- & cream. D-1G **65c**

HEATH PARASOL

Span 15½", length 8⅛". Suggested coloring: mostly orange, decorative black fuselage side panel. Excellent for beginners, and a duration flyer data. Kit D-26B **35c**

ING 85 MAIL

for beginners. Re- ed for beauty and greater duration than ones. Span 22 3/16", 16". Suggested ue: blue and Kit D-32B. **85c**

FOKKER TRIPLANE

Plane of Germany's greatest ace. Von Richthofen. Span 11¾", length 9⅛". Suggested coloring: all red. Kit D-14C **45c**

BOEING P-26 STANDARD PURSUIT

Formerly the XP936. Very popular. Much imitated. The most modern pursuit model of a low wing design. Authentically detailed to the tiniest gadget. Span 14⅛", length 12". Suggested coloring: yellow and olive drab. Kit D-23 ..... **65c**

Build the Complete Thompson Trophy Line-up

All six models from 1929 to 1934 (D-2-46-17-27-47-48) only 50c each. Think of it. If you purchase them individually, they cost 10c extra for packing and handling, but if six or more are purchased, no extra charge need be included. Simply send your $3.00 for the six models.

NOTE: There is no waiting when you order from "Cleveland." All orders are shipped the day they're received—everything is kept on hand in stock. MINUTE-MAN SERVICE!

Save an Extra 60c on These Prices

Since C-D "Dwarfs" sell for such a reasonable price, don't content yourself with ordering merely one or two models—order six or more at a time, thereby saving 60c or more on the packing and handling charges, for such really worthwhile bargains in the way of advanced Kits cannot be purchased elsewhere at any price (on orders for less than 6, we require a 10c handling and packing charge per Kit). Always keep a supply handy. Since no liquids are supplied, you may save money by buying larger quantities of cement and paper cement, as well as dopes, or you may use what you have on hand, employing any color you desire for the different ships, for we list only "suggested coloring" in the description of each model.

Read What Modelbuilders Are Saying About the "Dwarfs" and "Cleveland"

"My brother just received your 'Dwarf' Kit for the Douglas O-38. Truthfully, I never thought the 'Dwarf' would be even half as good. I never saw such a complete Kit."
FRESNO, CALIF.

"I wish you more power and an even greater success than that which you have already attained, for you are the originators of the *scale* flying models." SAN ANTONIO, TEX.

"I have built 14 of your models and have won a champion ribbon, 9 first place ribbons, 3 second ribbons; besides being offered $35 for your Cleveland Designed Boeing Low Wing Pursuit, with which I also won a champion prize. You may certainly expect more orders from me." LUDLOW, MASS.

"I was practically stunned at your prompt delivery. It usually takes three or four weeks after ordering for Kits to arrive, but yours came in a few days. I don't see how you are able to make your 'Dwarf' Kits so unbelievably low priced."
SAN JOSE, CALIF.

"I have been buying Kits from you for nearly three years now, and I have never found a thing wrong with one, never have I found a thing lacking. This is a record I think that you should feel proud of." DETROIT, MICH.

WEDELL-WILLIAMS

This model is a very beautiful and authentic version of the plane Jimmy Wedell himself flew to victory for the 1933 Cup. Capable of excellent speed flights. Suggested coloring: red with black scalloping and bronze motor crankcase and color separations. Span 10⅝", length 11⅜". Kit D-47 ..... **50c**

BAYLE'S GEE-BEE

1931 Air Race sensation. Span 11⅜", length 8¼". Suggested coloring: yellow and black. Kit D-17B **50c**

COMPER SWIFT

Redesigned. Excellent flights. Span 12", length 9". Suggested coloring: beautiful green, with black fuselage design. Kit D-33B **30c**

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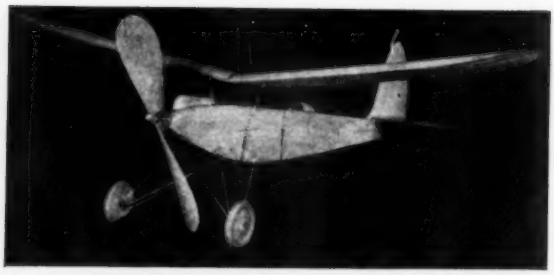
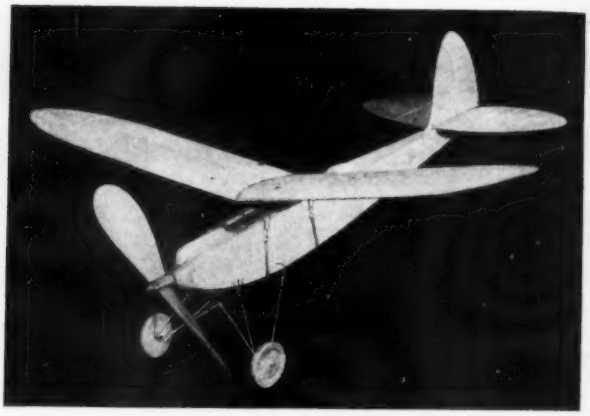
If your dealer can't supply you—order direct. We offer streamline delivery service—but we urge you first to go to your dealer, as more and more dealers are putting in a complete line of the C-D "Dwarfs"—or, why not get your dealer to do so, if he still does not stock them. If ordering direct, please mention his name and address, so we can write him. Above all—*send 5c at once for a complete Catalog of C-D "Dwarfs," and our standard ¾" scale line of 50 models, and C-D supplies.* Do it NOW!

MODELBUILDERS!



The smooth double surfaced wing and high pitched "prop" mounted on the fuselage described last month



Fundamentals of Model Airplane Building

By GILBERT MacLEAN

How You Can Build a High Pitch Propeller and Double Surface All-Balsa Wing That Can Be Used on the Model Described in the Preceding Article of This Series, for Long Distance Flights—Part No. 12

ALL of the models presented so far in this course of model airplane building have had what are commonly called *single surface wings.* That is, the upper surface of each wing was the upper surface of the sheet of wood forming the wing, and the lower or undersurface of the wing, was the undersurface of *the same wood sheet.* In other words, each of the wings was formed by a *single sheet* of wood.

Now, however, it is fitting to consider another type, more complicated in structure but more efficient in its function of creating lift with little resulting resistance. It is what is called a *double* surface wing. A cross section of a double surface wing, marked "RIB," is shown in the drawing. As can be seen, a double surface wing has considerable thickness. Its *upper* surface is formed by a *single sheet of wood* and the *lower* surface by *another* sheet, *not the same* sheet. In this case there is a space between the two surfaces.

The surfaces are held apart in their correct relative positions by ribs. They determine the wing cross section and are shaped in accordance with the type of wing section you desire.

Instead of giving you plans for an entirely new model with a double surface wing, in this instalment of "Fundamentals of Model Airplane Building," complete data is given for the construction of a double surface wing that may be used with the fuselage of the model presented to you in our preceding issue of this magazine. This double surface wing will fit on the fuselage nicely, in place of the single surface wing.

Also, in order to provide a variety of performance, another propeller of higher pitch and a free wheeling device is given in this article. These changes in last month's model provide you with a "distance" model that flies like a full scale racing plane.

In tests, this little ship has flown seven hundred feet when an eight strand lubricated motor was used, *wound by hand.* When a winder was used, it covered a distance of more than 1200 feet. If you construct this model properly you will find that it is one of the most remarkable fliers you have ever built. The following paragraphs will tell you how you can construct this double surface wing and the new high pitch free wheeling propeller for the model described in the preceding issue of MODEL AIRPLANE NEWS.

Wing Construction

The first operation in constructing the wing is to cut out ten ribs from 1/16" balsa according to the outline of the rib shown in the drawing. Use a very sharp knife. There are two additional ribs which are slightly different than the regular ribs that are located at the wing tips. The upper curve of these ribs is the same as the other ten ribs. However, the depth is 3/32" less than the other ribs.

If you wish, you may make the two tip ribs the same as the regular ribs and cut off 3/32" from their lower side.

Next cut out the main spar, which runs along the center of the wing. This is composed of two pieces, each one 9¼" long and 3/16" deep. They are cut from 1/16" sheet balsa. The leading edge is 3/16" square cross section and 23½" long.

Before assembling the framework, cut a notch at the front end of the ribs as shown in the drawing and into which the leading edge should fit snugly. There should also be a notch in each rib for the spar, except the two tip ribs.

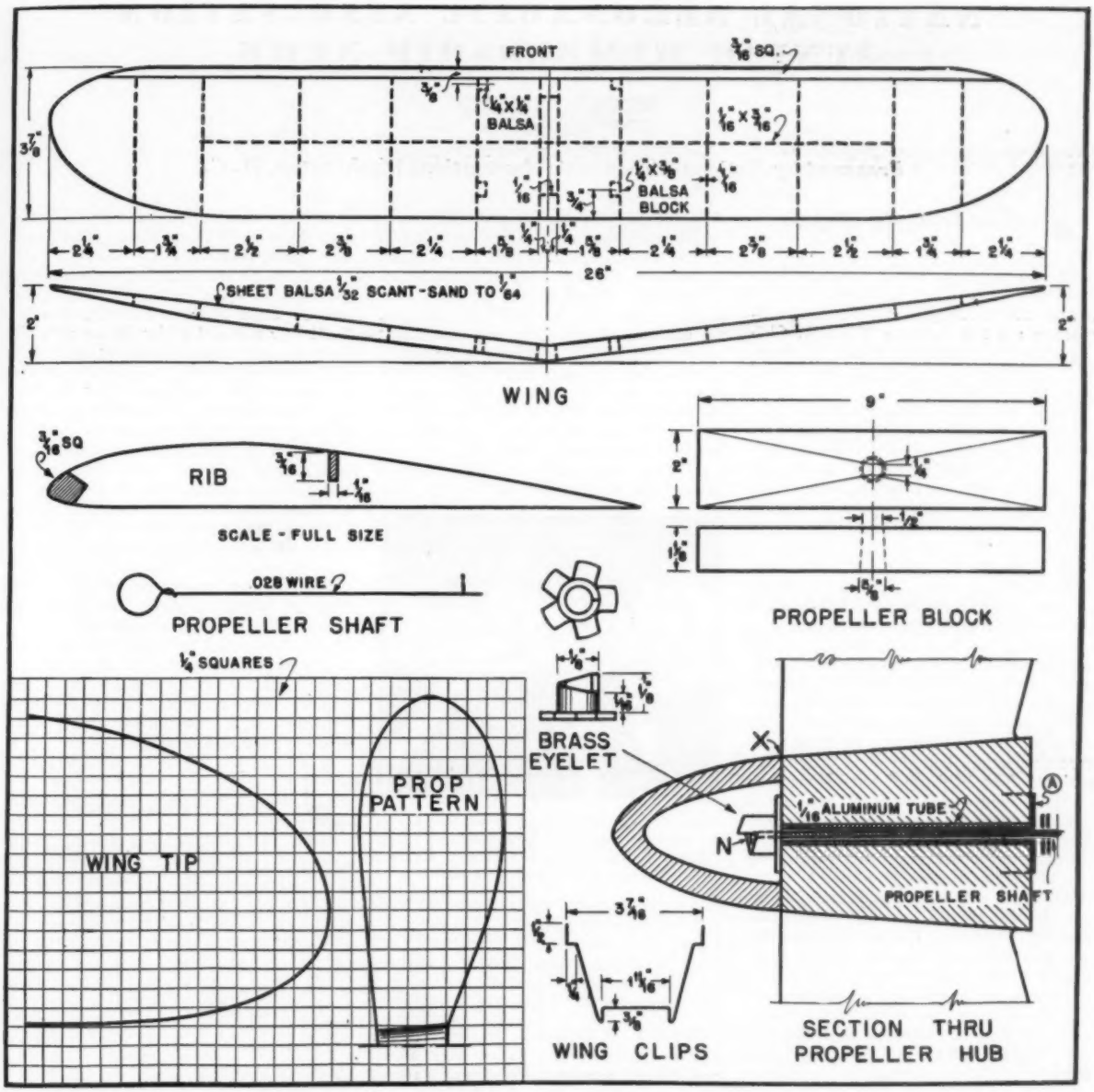
Now assemble the frame by gluing the front nose of the ribs to the leading edge. Space them according to the measurements shown in the drawing. Pins may be used to hold the parts together until the cement is dry.

Next insert the center spars in the notches of the ribs so that they come closely together at the center of the wing. Do not cement the two inner ends of the spar together. Cut the leading edge of the wing halfway betwen the two center ribs. Now the framework is composed of two halves.

You proceed next to bevel the leading edge and the spar gradually so that they come together snugly when each wing tip is raised two inches. When the fit is to your satisfaction, cement the two inner ends of the leading edge and the center spars together, keeping the wing tips raised two inches. Pins may be used to hold them in position until they are dry. In order to strengthen the joint at the center and the wing, two small pieces are cemented in between the two center ribs as shown on the drawing. One is ¾" from the leading edge of the wing, the other is ¾" from the trailing edge. A "V" should be cut in the top edge of these pieces to correspond with the wing dihedral.

Now you are ready to put on the undercovering of 1/32" balsa. This should be of medium grade and not too stiff, which quality would prevent you from forming it to the proper wing curve. Cut this under sheet to the proper size. It should be twenty-six inches long and four inches wide. The wing tips should be cut according to the curve given in the graph. Mark the center line on this sheet and cut out in two halves. If two separate pieces are used for this wing instead of one sheet, the weights of the two pieces are liable to be different and throw the model off balance. Cut these two wing halves from the same sheet of balsa.

Now apply cement to the undersides of the ribs of half the wing. After this is done apply the correct half of the lower wing to the frame before the cement dries. Pin it firmly to the ribs. Then apply cement to the leading edge of the framework, pressing up the under surface and pinning it even to this leading edge. This process should be followed along the leading edge



up to the last full size rib.

Bevel away the under edge of the leading edge from the fifth rib to the end of the leading edge. This is to allow you to bend up the undersurface of the wing so that it will meet the upper surface at the tip when the upper surface is in place. The bevel from this last full size rib to the tip should be absolutely straight.

When this is done, crease the lower wing surface at the fifth or last full size rib and bend it upward, cementing the lower surface to the underside of the leading edge where it has been beveled. Pin the leading edge and the tip rib to the sheet.

Now proceed in similar manner to balance the undersurface to the other half of the wing frame, joining the two undersurfaces neatly together at the center. Use plenty of cement to join their edges as this joint takes a great deal of the bending stress.

Before you put on the top surfaces, cement small blocks to the leading edge and to the inner surfaces of the second rib. These blocks are ¼"x¼" in cross section and are equal to the height of the rib where the lower and upper surfaces should be flush with the upper and lower edges of the rib. These blocks are to hold the ends of the center section struts. They may be seen clearly in the drawing. Two similar blocks should be cemented to the inner face of the No. 2 ribs for the rear center section struts. These are ¼" wide and ⅜" long. Their upper and lower faces should be flush with the edges of the ribs.

Now apply the upper surface of sheet balsa to the framework and the wing. Half of the wing should be covered at a time as in the case of the bottom surface, making sure that the frame is not warped. To do this apply cement to the upper edges of the ribs from front to rear. Quickly put the sheet balsa in place so that the rounded tips coincide with the edges of the rounded tips of the undersurface. The edge of the covering at the center should be cut straight along the wing center line. When it is in the proper position, pin it down tightly to the leading edge of the ribs and at the rear to the undersurface of the wing. Adjust by twisting wing to make sure it is straight.

Before cementing the sheet in place, it might be well to fit it to the shape of the wing, making sure that when it is cemented that the tips and the end of the sheet at the center will fall into the proper position. Be sure that the upper sheet is cemented firmly to the leading edge. Proceed to cover the other half of the wing in the same manner, making sure that the two upper surfaces join snugly at the center and that they are cemented to the two cross pieces passing between the two center ribs. When the cement is dry, round down the leading edge to the correct shape shown in

(Continued on page 36)

NATIONAL AERONAUTIC ASSOCIATION JUNIOR MEMBERSHIP NEWS

Prepared by National Aeronautic Association, Washington, D. C.

News From the Chapters

SYRACUSE, New York, has just been granted a Junior N.A.A. Charter for its Syracuse Model Airplane Club whose headquarters are the Syracuse Y.M.C.A. Club officers are: President, Donald V. Shetland; Secretary, Jean S. Chadwick; Treasurer, Henry Westhoff.

There have always been Syracuse representatives at the National Championship Model Plane Meets who have either won some of the events or placed high up on the list. It will be remembered that the 1934 Exhibition Scale Model Champion, Louis Casale, lives in Syracuse. His excellent work is evidence of the high standard set by Syracuse builders.

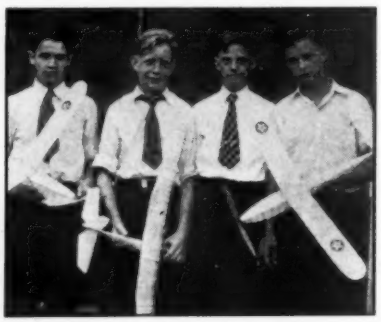
The club's motto is: "We strive to build for the future in Aviation!" The purpose of the club is to stimulate interest in aviation among the boys of Syracuse through the medium of model building and to endeavor to bring together into an organized unit the model airplane builders of the city.

This group has been organized as a club for many years and is established on a secure foundation, both in aims and in experience. The Advisory Council is made up of civic minded gentlemen of prominence and the chairman of this council is Mr. Harry C. Copeland of the Syracuse Exchange Club, under whose sponsorship the new chapter carries on its work.

There are six committees responsible for the club's activities, namely: Instruction, Exhibit, Publicity, Contest, Membership and Research. The regular time of meetings is Friday night at seven o'clock. All those who are interested in membership in this fine chapter may write to the Secretary, Mr. Jean S. Chadwick, Syracuse Model Airplane Club, Y.M.C.A., Syracuse, N.Y.

ST LOUIS, Missouri, Junior N.A.A. Chapter, The Stix Baer and Fuller Model Airplane Club, is arranging to hold elimination contests to determine the limited number of club members who will compete in the 1935 National Championship Model Plane Meet. Those who do not qualify for places on the final list will have, at least, the pleasure of witnessing one of the best meets ever held. Competition is especially keen as there are many expert builders and flyers in the club, but it would obviously be unfair to out of town builders were the St. Louis members to enter the national meet in unrestricted numbers.

At the 1934 National Championship Meet, Marvin Schmidt, one of the St. Louis club members, won the Admiral Moffett International Contest. Two other St. Louis members, Russell Yungbluth and Ralph Kummer, placed fourth and fifth respectively in the Moffett, thus showing a club strength that has great significance.



Four ST. LOUIS boys who are hoping to be in 1935 National Championship Meet "Billy" Pascoe, Leland Schubert, Edward Levey, and "Dick" Courtial

FRESNO, California, Junior N.A.A. Chapter, through the club secretary, Howard Roberts, reports the results of a recent election of officers. Daniel Loder is the new Club President; William Short, Vice President; Howard Roberts, Secretary. The Board of Directors is made up as follows: Jack Paxton, William Short, John Jenco, and Chick Vartickian.

The Fresno members hold informal model contests every Sunday afternoon. At one of these sessions recently, Sanford Scott flew a model glider for an unofficial flight of over twenty-seven minutes. The glider was of the type flown by Robert File at Akron, Ohio, last June when he made an official record of over twenty-three minutes.

The Fresno club has been doing some experimenting up in the snow fields to test the different currents of air that are set up there. The results of these tests will be of great interest to all Junior N.A.A. members so it is hoped that a report will come from Fresno soon telling of the snow effect.

One of the Fresno projects is a Far Western Model Airplane Conference. All Junior N.A.A. organizations west of the Rocky Mountains are asked to co-operate in helping to make this event one of the largest contests ever held in the Pacific States. Inquiries should be addressed to Junior N.A.A. Fresno Chapter, Hotel Fresno, Fresno, California.

National Championship Meet

THE St. Louis Junior N.A.A. Chapter and its sponsor, Stix Baer and Fuller Company, who are organizing the 1935 National Championship Model Airplane Meet to be held in St. Louis June 27-29, announce that the outdoor flying will be conducted on the St. Louis Municipal Airport, Lambert Field. This is the regular transcontinental airport and is exceptionally well suited for model plane flying. Many convenient highways parallel the airport and offer ample opportunity for following the models on their cross-country flights.

All flying by large planes, other than regular transport passenger flying, will be suspended during the day so that interference will be reduced to a minimum. The airport officials are greatly interested in the meet and have offered to assist in any way possible.

Indoor contest flying is to be held in the St. Louis Arena, one of the best buildings in the country for the purpose. The ceiling is about one hundred thirty feet and floor area is amply large. There are seats for spectators so that large crowds may witness the flying without interfering in any way.

The sponsors have made extensive arrangements for entertaining contestants and officials. St. Louis is one of the pioneer cities in aviation and has always taken great civic pride in its many contributions to flying. Colonel Lindbergh did much of his preliminary flying there and the city has placed his medals and trophies in a beauti-

NATIONAL AERONAUTIC ASSOCIATION OF U.S.A.
DUPONT CIRCLE
WASHINGTON, D.C.

I hereby make application for membership in the National Aeronautic Association as a Junior Member. I am under twenty-one years of age.
I enclose fifty cents for initiation fee and first annual dues (Use check or money order.)

Name .....
(Please print or type)

Street .....

City ..... State .....

Date of Birth.....
(Month, Day, Year)

Approved .....
(Parent sign here, if applicant is under eighteen)

ful museum. All who attend this year's model plane meet will be shown this exhibit, just one of the many outstanding attractions that are offered.

Contestants and officials are to be given lunches on the days of the meet and are to be invited to attend the big banquet on the evening of the last day of the meet in the beautiful Moderne Restaurant of Stix Baer and Fuller Co. Very reasonable hotel rates are being arranged for all who attend.

Full particulars are to be published in next month's issue of this section of MODEL AIRPLANE NEWS, including all the complete rules, full instructions about how to secure entry blanks, details that have not yet been published; in fact, all about this supreme event in the model airplane world.

For the benefit of those who are interested in the Exhibition Scale Model Contest, the winner of which receives the MODEL AIRPLANE NEWS Trophy, the rules follow. Models may be built to any desired scale. No model shall, however, be more than 48 inches in its greatest dimension. Models shall be accompanied by a drawing giving all dimensions and chief details to help the judges. Each model shall be an exact replica of a man-carrying heavier-than-air machine, every part being proportional in size and location to the corresponding part of the large machine. Models will be judged on fidelity of scale, general workmanship, neatness, amount of detail, originality, color and finish. An entrant may enter more than one model but may not win more than one award. Models must be shipped so as to arrive in St. Louis no later than June 20.

There will be offered an exceptionally desirable prize in addition to the customary trophy for winning first place in this year's scale model contest. Full details about this are to be published later.

New Official Records

TWO new model airplane records have been given official recognition since last month. William Latour, Philadelphia, flew his Class B, Indoor, R.O.W. Fuselage model for a record flight time of 5 minutes 42 seconds. This flight was made in the Fourth P.M.A.A. Indoor Meet of the 1934-1935 season on February 15. Latour is an open class contestant and holds three national records.

Louis Young, Boston, flew his indoor Class B, hand-launched glider for a new record of 27 seconds, thus surpassing his own record. This record flight was made on March 2 in a regularly sanctioned meet conducted by the Jordan-Traveler Junior Aviation League.

Wakefield International Competition

THE 1935 Wakefield Competition is scheduled to be held at Fairey's Airodrome, Hayes, Middlesex, England, on Monday, August 5th. The United States, as are all countries, is allowed to enter a team of six.

The contest is for fuselage models whose wing area is 200 square inches plus or minus a tolerance of 10 square inches, and each model shall weigh not less than 4 ounces. Rubber driven models, only, are permitted. The rubber motor must be concealed and the fuselage must be completely covered and conform to the formula:—

A group of Fresno, California, Junior N.A.A. Members

$$\text{Minimum value of Maximum cross-sectional area of fuselage to equal} = \frac{(\text{Overall length of entire model})^3}{100}$$

Three members of the American team have already been named and the others are to be selected on the basis of their proved performance. No model will be accepted in England except those which are authorized by the National Aeronautic Association.

Cleveland National Air Races Model Airplane Meet

THE Scripps-Howard newspapers are sponsoring the 1935 National Air Races Model Airplane Meet as a part of the large plane races, held in Cleveland, Ohio, during the latter part of the summer. The rules for this event and the dates will be made available later.

There are twenty-six Scripps-Howard newspapers that are expected to hold sectional elimination contests prior to the Cleveland meet. Each one of these is expected to form a local Junior N.A.A. Chapter provided there is not already such a chapter in its city. This insures the entire Scripps-Howard Junior Aviator contest program being conducted under N.A.A. rules and supervision.

An interesting provision in connection with the Cleveland National Air Races Model Plane Meet, is that plans are under way to hold the indoor events in the Goodyear-Zeppelin Air Dock at Akron, Ohio.

OFFICIAL MODEL AIRPLANE RECORDS

Approved by Contest Committee of the N.A.A.
Through March 5, 1935

INDOORS

STICK MODEL AIRPLANES, Hand-launched

CLASS B

Junior: John Whitehouse	Springfield, Mass.,	13m 04s
Senior: Ralph Kummer	St. Louis, Missouri	17m 49.8s
Open: Michael Lichstein	Philadelphia, Pa.	14m 45.8s

CLASS C

Junior: John Stokes	Huntingdon Valley, Pa.	18m 53.4s
Senior: "Pete" Andrews	Philadelphia, Pa.	20m 22.8s
Open: Carl Goldberg	Madison, Wis.	22m 59.4s

STICK MODEL AIRPLANES, R.O.G.

CLASS A

Junior: Joseph Pruss	Philadelphia, Pa.	10m 25s
Senior: Merrell Malley	Atlantic City, N. J.	10m 56.4s
Open: Michael Lichstein	Philadelphia, Pa.	8m 40s

CLASS B

Junior: Louis Shumsky	Atlantic City, N.J.	9m 15.2s
Senior: William Latour	Philadelphia, Pa.	14m 40.2s
Open: Michael Lichstein	Philadelphia, Pa.	11m 06s

STICK MODEL AIRPLANES, R.O.W.

CLASS A

Junior: James Shivler	Philadelphia, Pa.	3m 41.8s
Senior: Paul Karnow	Philadelphia, Pa.	5m 01.4s

CLASS B

Junior: James Mooney	Philadelphia, Pa.	8m 37.6s
Senior: Mayhew Webster	Philadelphia, Pa.	11m 55s

GLIDERS, Hand-launched

CLASS A

Junior: Kenneth Nelson	Boston, Mass.	26.6s
Senior: David B. Hecht	New York City	34.4s

CLASS B

Junior: Louis Young	Boston, Mass.	27s
Senior: David B. Hecht	New York City	31.6s

CLASS C

Junior: Stanley Congdon	Glen Ridge, N.J.	17s

AUTOGIROS

Junior: Raymond Steinbacher	Ridgefield, N.J.	57.2s
Senior: Alton H. DuFlon, Jr.	Ridgefield, N.J.	2m 01.2s

FUSELAGE MODELS, R.O.G.

CLASS B

Junior: Hyman Oslick	Philadelphia, Pa.	7m 59.6s
Senior: Herbert Greenberg	Newark, N.J.	12m 23.5s
Open: William Latour	Philadelphia, Pa.	6m 48s

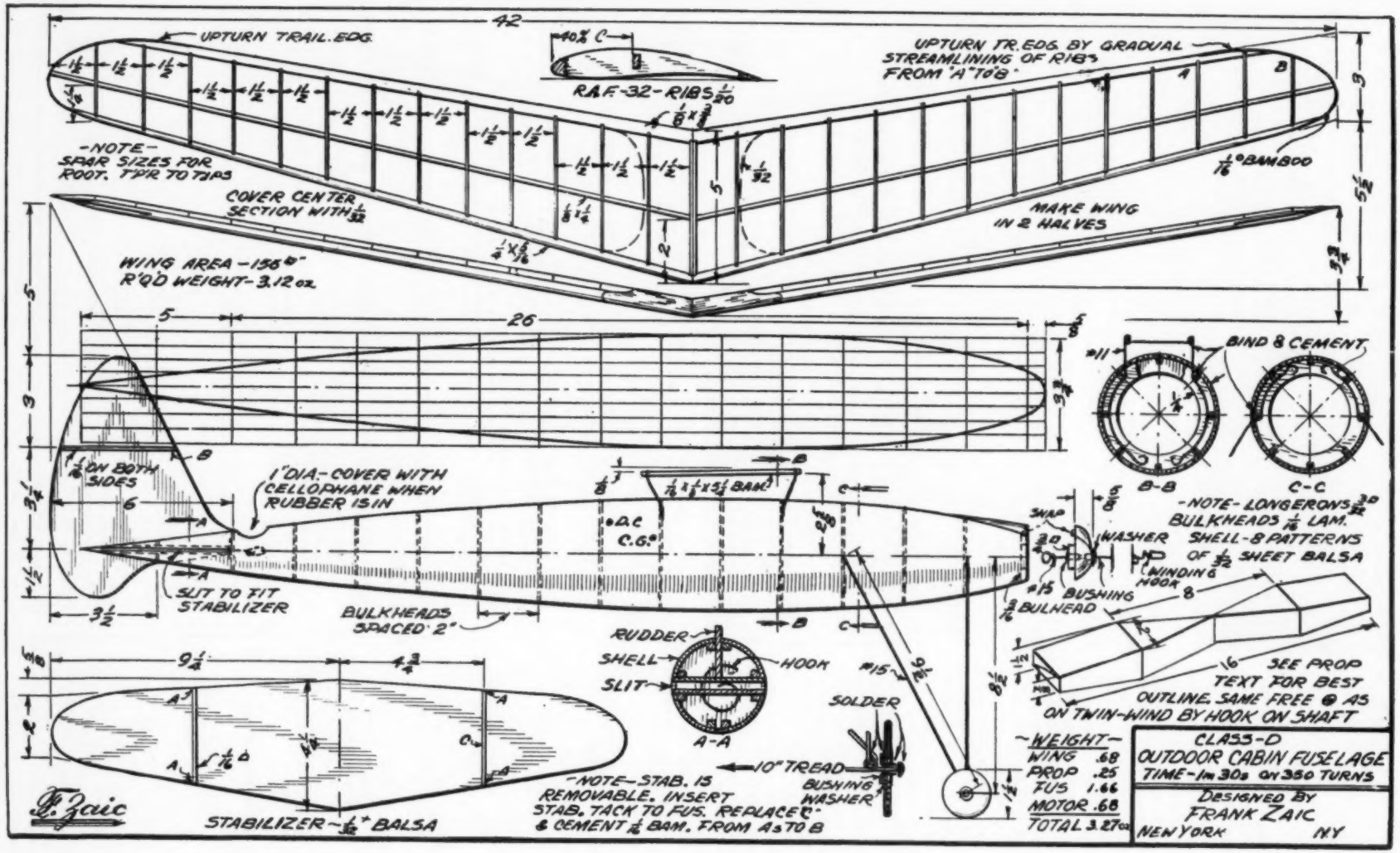
CLASS C

Junior: Hyman Oslick	Philadelphia, Pa.	12m 59.4s
Senior: Emmanuel Enderlein	Philadelphia, Pa.	13m 24s
Open: Jesse Bieberman	Philadelphia, Pa.	6m 31.2s

FUSELAGE MODELS, R.O.W.

CLASS B

Junior: John Stokes	Huntingdon Valley, Pa.	3m 23s
Senior: Bruno Marchi	Boston, Mass.	3m 11s
Open: William Latour	Philadelphia, Pa.	5m 42s



An Interesting Outdoor Contest Model Designed by Frank Zaic, New York City, Built to N.A.A. Specifications

An Open Forum for Readers, What They Think, Do, and Say, Presented So That All Who Read May Enjoy and Benefit by an Exchange of Ideas

READERS have been kind enough to send in some very useful ideas this month. One that will be appreciated especially is a device for bending bamboo without burning it. Model builders who have worked with this material undoubtedly have had many occasions for profanity. The designer of this machine, W. Kuhnke, guarantees that it will do your bamboo bending job efficiently and with little trouble. Also, eliminating profanity, we hope, will tend to raise the moral code of model builders.

Figure No. 1 is a diagram showing the various parts and how they are put together. Mr. Kuhnke explains the construction of this machine as follows:

Bamboo Bending Device

"Fasten parts C and B with wood screws. Bend A with 4-inch diameter semicircle at one end and ½-inch diameter at the other. Fasten to C and apply braces D. Part A is made of sheet tin. Part B is a block of wood ¾ of an inch thick, 8 inches long, 3½ inches wide at the large end, 1 inch wide at the small end of the taper and 2½ inches wide at the large end of the taper. Part C is a piece of pine ¼ of an inch thick, 4 inches wide over-all at the shoulder, 3½ inches at the base, 4¼ inches high and 2¾ inches from the base to the shoulders. Part D is made of pine ¼ of an inch thick, 2¾ inches high and 2¾ inches wide. It is beveled as shown in the diagram. The diagram also shows how these parts are fitted together. A candle is inserted, as in the figure. To use it, light the candle beneath the hood so that the metal hood becomes hot. The bamboo can then be curved by bending it over the metal hood. The different radius given by the hood from one end to the other will enable you to bend your bamboo to any curve desired."

Has anyone tried a device similar to this? If not, build it and let us know what you think of it.

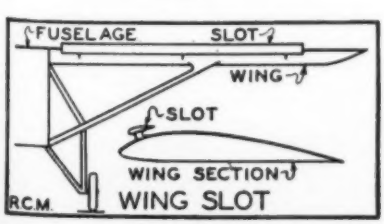


Figure No. 2

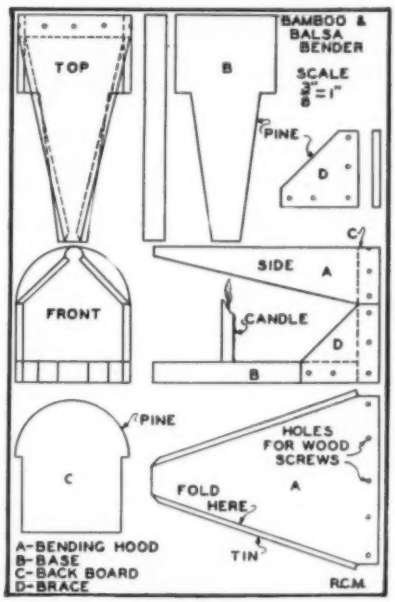


Figure No. 1

Jack King has been doing a little experimenting with wing slots. He has been quite successful and he passes this idea on to you.

Wing Slots

Figure No. 2 shows the disposition of the slot, or auxiliary wing, on the main airfoil surfaces. Mr. King says this slot has reduced the stalling tendencies in his models. The slot is a curved piece of balsa located on the leading edge of the wing. There is a distance of about an eighth of an inch between the wing and the slot.

Try this idea and let us know what you think of it.

Often model builders find themselves in a predicament because they have not a winder handy, yet they wish to lubricate, stretch, and wind their rubber motors for long flights.

An Impromptu Winder

Figure No. 3 shows a method of construction which will allow you to pull out the propeller and bearing from the nose of the airplane so that the motor may be stretched when it is wound by turning the propeller. The model flyer may hold the nose plug with the left hand and wind with the right. When the motor is completely wound the plug is inserted back into its normal place.

This idea has been used by Allen Weeks for some time and he has found it very successful. He passes it on to you.

"A clamp! My kingdom for a clamp!" has been the pitiful cry of many model builders when curved parts refused to remain "stuck" together. Some builders use pins. However, this is not always possible. Often a small, light clamp is just the instrument that will make your work perfect. Mr. W. Roy Bird comes to your assistance by suggesting that you make a clamp as he shows in figure No. 4. He has used it very successfully. It is simple and easy to construct.

Mr. Bird also has a few pertinent remarks concerning model flying which, no doubt, readers will appreciate.

Building Model Aircraft

"Few people realize the importance of building model aircraft. For instance, I

(Continued on page 43)

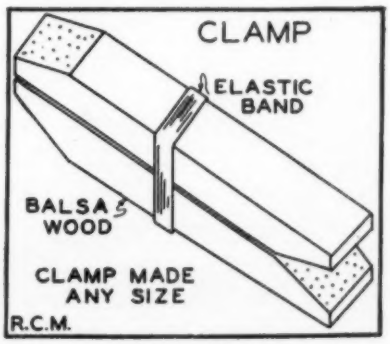


Figure No. 4

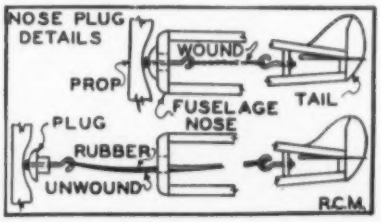
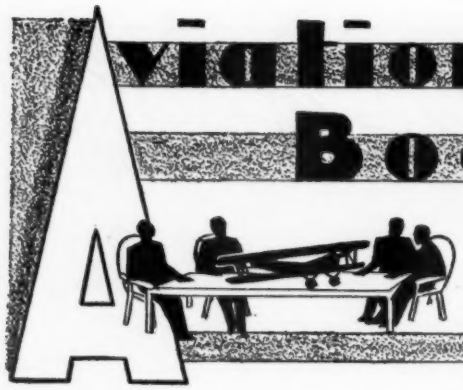


Figure No. 3



Aviation Advisory Board

Conducted by
CHARLES HAMPSON GRANT
Chairman of the Board
Formerly of
The Technical Section, Air Service, U.S. Army

MORE than thirty years have passed since the first airplane flew under its own power, yet the same controversy rages at the present time that was uppermost in the minds of many of the pioneers of the "old days". Bill Davidson of Payne, Alabama, brings up this "age old" question concerning the relative values of a monoplane and a biplane. His question is:

Question: Which is more efficient as far as maneuverability is concerned?

Answer: All of the factors being equal, the biplane is more maneuverable. This is primarily due to the low moments of inertia which exist because the weights of the structure are closer to the center of gravity of the airplane in the case of the biplane than the monoplane.

In the next question Davidson is very subtle. He is evidently trying to bring out the fact that a biplane is more desirable for pursuit work.

Question: What is the most important factor of a pursuit plane?

Answer: There is no one most important factor in a pursuit plane. A pursuit plane must have several factors in regard to performance, to a high degree, if it is to be worth anything. First, as Davidson supposes, it must be highly maneuverable. Second, it must have extremely high speed or an extreme rate of climb. If it is maneuverable without the latter qualities, it is a poor pursuit ship for it can only fight when someone attacks it. Under these conditions it is at the mercy of the enemy, for the enemy can choose his altitude and the time at which he wishes to run away.

As a rule, monoplanes are faster than biplanes, yet biplanes are more maneuverable than monoplanes. For this reason we have a varied assortment of the two types used as pursuit ships. Lately the monoplane has become popular because it has been possible to reduce the wing area and the span of the wing itself to such an extent that the monoplane actually is no bigger than the biplane. For this reason it is as maneuverable as the biplane.

Someone will say, "Well, why not make the biplane smaller, using the same amount of wing area as in the case of the monoplane?" The answer is that the biplane cannot be made smaller because it is necessary to have a certain amount of fuselage space. In other words, the fuselage must be large enough to carry gas tank, military equipment, pilot, engine, etc. Thus, the present size of the biplane is determined by the fuselage.

There are many other factors which make this problem very involved. It is obvious that these cannot be taken up here. However, perhaps our discussion here will help to promote some thought on this matter among our readers. If questions come to your mind, write to us and we will try to answer them.

Here are a few more questions:

Question: If you put two strands of rubber in a plane and coat them with rubber lubricant, would it get power even if the plans of the plane told you to use one strand, or would the power be too much for the plane?

Answer: Yes, you certainly would get power. Whether you get too much power or not would depend upon the type of plane in which you made this change. Usually a plane is designed so that it will withstand the tension of the correct amount of rubber. If double the amount of rubber is added, the tension will probably be sufficient to twist the body of the plane out of shape, if not break it, especially if the ship has been well designed; inasmuch as a well designed ship is never made stronger than is necessary. Added unnecessary weight puts a greater load on other parts of the plane. The only way to determine whether or not two strands would be too powerful is to try it.

Question: Is it best to put a weight on one side of the propeller blade to make it turn better?

Answer: This question is very ambiguous. What side of the propeller are you referring to? We have never heard of adding weight to one side of the propeller to improve its performance, unless it was originally out of balance.

Question: On a large gas-powered model, what percent of the wing area should the stabilizer area be? What percent should the rudder be?

Answer: The area of the stabilizer may be as small as 20 percent of the wing area on most gas-powered models. It is usually advisable to use from 25 percent to 30 percent. The area of the rudder, or fin, should be not less than 6 percent of the wing area. There is no exact percentage that necessarily must be used. The designer must keep in mind only the fact that the greater the amount of area used, the greater the steadiness and stability of the plane will be. Many planes will fly with very little area, but their flight is erratic and often results in crashes when unusual air conditions exist. A large amount of tail surface insures safety under all conditions.

Walter Powell of 1408 Bernal Avenue, Burlingame, Calif., would like to have some information on the following questions:

Question: Does your system of placing the center of gravity at 50 percent of the wing chord from the leading edge, have any relation to the calculation pertaining to the "Aerodynamic Center" in Mr. Max Munk's article, appearing in *Aero Digest*?

Answer: We have not read Mr. Max Munk's article and cannot state definitely regarding this. However, we should say

(Continued on page 47)

Here is the new Douglas XFD-1 two-seater fighter. It has a speed of about 225 m.p.h., powered with a Wasp 735 hp. engine (By Cooke)

A Model Anyone Can Build and Fly

(Continued from page 7)

G. Landing gear strut, 1/32" x 1/16" x 31/32" (2 pieces)
H. Landing gear strut, 1/32" x 3/32" x 15/16" (2 pieces)
I. Wire hook for rubber sling launching from medium size hairpin.
J. Tail wheel (stationary) 1/32" x 3/16" x 5/16"
K. Top view of fuselage showing position of wing
L. Position of nose weight (see directions)
M. Propeller, 1/16" x 1/32" x 1¾" (optional)
L. E. Leading Edge

Model Building Instructions

The wing, side view of fuselage rudder and elevator are shown in black. These are your patterns. They may either be cut out from the page to lay on the wood and their outlines traced, or tracing paper may be used to transfer the outlines of these patterns onto the wood. The latter method is suggested so as not to destroy the magazine.

Cut out all parts with a *sharp* knife and round off smoothly with the finest sandpaper. The fuselage as shown in the top view is 3/32" thick. Taper the rear part of the body down to 1/32", if you wish an extremely fine job. Carefully attach the landing gear struts lettered F, G and H with a few drops of cement and next the tail wheel.

Since the wing is thin, it is quite flexible and it is not necessary to heat or steam the wing in order to curve it. Simply apply cement over the area where the wing is to be placed, shown by K, and mount it exactly in the center as shown by the white dotted lines in the top view of the wing. Hold the wing in the curved position by pressing a pin through the wing and into the body at the leading edge, and one at the trailing edge until the cement is dry.

Next slip the elevator in its slot and apply a little cement. The rudder is then set in place and cemented. The wire hook shown by I in front and side views is bent to shape. It may be made from wire cut from a medium size hairpin. (Not a large one.) Push the hook part way into the fuselage just ahead of the landing gear strut F, shown in the side view. The wheel pants are cut out with the lower portion of the wheel as part of it. Two "pants" of course, are necessary. Cement these pieces to the landing gear struts shown very clearly in the front view drawing, after you have sanded a flat vertical surface at their lower ends where they meet. Also note the "toe in" angle of the wheel pants; a characteristic of the large ship.

For the nose weight, the writer has found that lead foil serves the purpose best. It is easily bent in any direction and it can be ripped easily if necessary in order to take off little portions to decrease weight. It holds well to the balsa when cemented.

Obtaining the best gliding angle is a matter of experimenting with the weight and can be determined in a few minutes. The propeller shown in the sketch M is not necessary, but when hand-launching the glider, a spinning prop may be attached to give it a realistic appearance. In slingshot launching, it must be discarded.

The slingshot is made from a piece of hard wood 3/32" square and 4" long. Make a slot ⅛" deep at one end, insert a piece of rubber 1/32" square making a knot at one end to keep it from slipping out. At the other end of the rubber, which is 4" long, tie a loop. The sling is now completed.

Most builders would like to paint their model and so the following color scheme is given. The entire model with the exception of the striping on the fuselage sides and wheel pants, should be cream white while the striping is bright red. The pilot's cabin windows and the fuselage windows should be outlined in black as well as the door. This color scheme was copied from the real ship, although the model builder may use any two color combination he desires. Use diluted lacquers and apply with a soft brush. Launch your model into the wind.

How To Build a Reliable Gas Engine Model

(Continued from page 19)

ends, as shown in side view. The flat face of the blank will be the trailing face of the prop, while the tapering face will be the leading edge. Drill the hole for the prop shaft, then carve the concave or trailing face of the prop. You will notice that the trailing face of the prop is convex at the hub so as to strengthen the blade, changing gradually so that it is flat at about 1/3 the distance from the hub, and gradually turning concave till at the tips, the cupping is 3/32" deep.

When you have carved both blades in this manner, cut and sand them to the blade pattern shown in top view. Carve the convex or leading face of the prop so that the cross sections at the stations indicated will be the same as shown on the plan. Sand the blades smooth, balance the prop, then give it three coats of lacquer. (Silver lacquer will give the prop a metallic-looking finish.) Balance the prop after each coat of lacquer has dried thoroughly.

Fuselage (Plates 5 and 6)

[Note: The nose cowl and stern are not put on the fuselage until after the fuselage frame is finished and adjusted to anchor the motor-mount.] Select a soft board, about 1¾" x 12" x 84" on which to make the fuselage sides. Draw a base line about 2" from the long edge of the board. Be sure that this line is absolutely straight and that any other lines you will have to draw are drawn accurately, as the angle settings of the wing and tail unit will depend on the accuracy of your fuselage.

Draw a perpendicular to the base line about 6" from the left side of the board. This line determines the positions of station "1". Draw another line parallel to this one, but ¼" to the right of it, and you have the vertical strut position of station "1". Just above the side view of the fuselage, you will find the dimensions necessary to determine the positions of the other twelve stations. After you have

drawn the positions of the vertical struts, make a dot 2" down from the base line on station "1", 1⅞" down on station "2", 2¼" down on station "6", and 2¾" down on station "11".

Using the same curve as shown on plan, join the dots on stations "1" and "2". Join the dots on stations "2", "6", and "11" with a straight line. From stations "11" to "13", draw a line 3⅝" below the base line and parallel to it. This will give you the top outline of the fuselage side. To obtain the bottom outline, measure down from the top outline at each station, the distance indicated on the bottom of the side view of the fuselage, and make a dot there. (The distance from the top longeron at station "13" to the bottom one is 2". The 2⅜" shown on the plan is the overall distance from the top curved stabilizer anchorage to the bottom of the fuselage.) Connect the dots with a line, using the same curve as shown on plan. This will give you the outline of the fuselage sides. Make a pin-jig by driving 1" wire brads at strategic points just outside the fuselage outline. As with the motor-mount, remember that you have to make a left and a right fuselage side. Set the ¼" square medium hard balsa longerons against these pins, drive brads against the longerons wherever necessary in order to keep them in their proper shape. At station "11", cement enough ¼" thick balsa filler blocks between the top longeron and the lower top longeron so that you may later cut out an anchorage cradle for the stabilizer as shown on plan.

Cement the vertical struts into place. Notice that the vertical struts at stations "1" and "3" are ¼" sq. bass, while the remaining vertical struts are 3/16" sq. medium balsa. When you have all the vertical struts cemented into place, make a set of bass anchorage blocks "D" and cement them firmly into position against the longeron and station "3" vertical strut and against the longeron and station "1" vertical strut. Cement the diagonal struts "B" into place and you are ready to put the sides together. Assemble the fuselage frame by first cementing the horizontal struts of stations "1" and "13" between the fuselage sides, then cementing the other horizontal struts into place. Cement the landing gear anchorage blocks "C" into place at the bottom of station "1" (see station "1" detail, plate 6), then cement the diagonal struts "B" into place. Cement the window struts "G" (see top view) and "L" (see side view) into place, and cover these window frames with celluloid. Make the fuselage bulkheads by first cementing the vertical brace struts into place (see Index of Bulkheads, plate 6), then the filler strips, then the horizontal brace struts. Check the station "1" and "3" bulkheads frequently by inserting the motor-mount into position and making sure that it anchors properly. Finish the bulkheads by cutting them to shape as shown in the typical bulkhead detail on plate 6.

When the fuselage frame is finished, drill the lock-pin holes through the station "1" and station "3" vertical struts, set the motor-mount into place, put the lock-pin through the station "1" vertical struts and the forward holes of the motor-mount. Mark out the position of the rear lock-pin hole on the motor-mount by pushing the

lock-pin through the vertical strut of station "3".

When the lock-pin reaches to and hits the motor-mount, make a slight indentation in the motor-mount by twisting and pushing the lock-pin against it. Remove the front and rear pins, take out the motor-mount, and drill the rear lock-pin hole at the point that has been indented by the pin Build the stabilizer anchorage cradle and stern at the rear of the fuselage, then make the nose cowl frame at the front of the fuselage. Cement the plywood shock-distributing plates "E" to the sides of the fuselage frame, then cover the fuselage with medium light balsa sheets as indicated on plan.

Landing Gear (Plate 7)

With the aid of a hack-saw, file and drill, make the front and rear side landing plates, then screw them to the fuselage sides as shown in side view, plate 5. Since the .096 music wire of struts "A" and "B" is so heavy, you will have trouble bending it with a pair of pliers. Probably the best way to bend it would be with a vice and a hammer. The side landing struts "A" and "B" are made in two halves, a right half and a left half, and are joined in the centers of horizontal struts "A-A" and "B-B" as shown on plan.

When you have the wire struts "A" and "B" bent to shape, washers soldered in their proper positions, and the struts joined by wiring and soldering, make the bass stiffening struts. These are made by cutting the wood to size (⅜" x ¾" x length), channeling the front edge to receive the wire struts, tapering the struts, then shaping to the cross-sections shown at "X-X" and "Y-Y". Put plenty of cement into the strut channels, fit the bass stiffening struts to the wire struts "A" and "B", then wire the wood struts firmly to the wire struts as shown in the side pattern view.

Coat the struts well with cement, then cover the struts with silk by spiral winding with strips of silk about 1" wide. Give the struts about 3 coats of clear dope, then about 2 coats of colored dope. Make 2 front bottom landing plates, then anchor the side landing struts to the fuselage as shown in "Landing Gear Attachment Detail", plate 8. Strut "B-B" is anchored into place by removing the "U" shaped landing plate "O", placing the strut "B-B" against the bottom of the rear landing plate "I", then screwing the outer plate "O" back into place. Bend the axle strut "C" to shape and anchor it into place, taking care to solder the washers into their proper positions (see "Front Shock-Absorbing Detail"). Bend the wire strut "D" to shape, then wire and solder it into place.

The wheels are rather simple to make. Just follow the information given in the "Wheel Detail". When the wheels are finished, cover them with silk, then give them 3 coats of clear dope, and 2 coats of colored dope. When dry, slip them on the axle strut "C", then anchor them there by soldering a washer at each end of the axle.

Tail-Skid (Plate 7)

Cut and sand the tail-skid block "S" to shape; bend the skid wire as shown on plan, then anchor it to the block with cement and heavy thread. Cement this unit to the fuselage as shown in side view, plate 5.

Wing Mount (Plate 4)

Make the two wing-mount sides, then put them together as shown on plan. The various members are nailed and cemented together (regular model airplane cement), and braced with wire as indicated. The wing-mount should fit snugly on the fuselage, but not too tightly.

Assembly (Plate 8)

Bolt the rudder to the stabilizer, then set the tail unit into the anchorage cradle of the fuselage. Align this tail unit properly, then cement the balsa placement lugs (see plate 1) to the underside of the stabilizer, so that they fit flush against the fuselage side. (The lugs are cemented to the stabilizer only, not to the fuselage.) Take the tail unit off the fuselage and allow the lugs to dry into place. When you are ready to make a flight, tie the tail unit into place with flat rubber strands (⅛" x 1/32"), fit the motor-mount into the fuselage and pin it into place, tie the wing-mount to the fuselage with rubber strands, then tie the wing to the wing-mount as shown in the "Wing Attachment Detail."

Flying the Model

Getting the ship ready for flight is a two-man job. To obtain the proper balance, have the ship picked up by the wing tips with the fingers about 50% back of the leading edge of the wing. The ship should balance on an even keel. If the nose points down, move the wing-mount forward. If the nose slopes upward, move the wing-mount back until the ship does balance on an even keel. If the ship has been built properly, you will have the correct wing and stabilizer angles of incidence. Select a large open field on which to make the test hops. Feed the engine tank about an eye-dropper full of fuel, start the engine, then let the ship R.O.G. into the wind, giving it a start by giving the fuselage stern a good push. The ship should run between 50 and 75 feet, gradually ease itself into the air and start a nice slightly-banking climb. If the ship seems to stall, *lower* the trailing edge of the stabilizer a bit. If it dives,, or fails to climb properly, *raise* the trailing edge of the stabilizer a bit, (about ⅛"). The rudder should be kept neutral during the first test hops. If the ship banks excessively, give it a bit of opposite rudder. Once you've got the ship properly adjusted, fill the tanks of both the model and of the car you're going to chase it with, start the engines of the model and of the car, launch the model, then climb into your car and start out on the cross-country trip that is bound to follow.

Fundamentals of Model Airplane Building

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the drawing. Sand down the tips and trailing edge so that they are smooth and will produce little resistance. The whole surface may be sanded to 1/64" thick with medium grade sandpaper so as to even down the balsa sheet and make it perfectly smooth.

To finish the job, sand it all over with fine sandpaper.

Next shape the wire clips carefully ac-

cording to the measurements given in the drawing. The front and rear clips are to be made exactly the same. The two straight ends of each clip fit up into the wing and the small balsa blocks which have been glued in place. The front one should be inserted into the wing 3/8" from the leading edge and the rear clip 3/4" from the leading edge. If the blocks have been put into the proper places, this will insure you that the ends of the clips have passed into the center of the blocks. It will be well to hold the wing up against a strong light in order to determine the exact location of the blocks so that you can insert the clips properly.

When the clips are in place, apply plenty of cement around them where they come in contact with the undersurface of the wing. The upper ends of the clips will protrude from the upper side of the wing. Cement these ends firmly. Make sure that the clips have been bent properly and each line up correctly so that when the wing is placed on the body it will be straight and not skewed to one side. The wing is attached to the fuselage in the same manner as the single surface wing discussed in last month's issue.

Propeller

The propeller is cut out from a block of medium hard balsa. Do not use soft balsa. This block should be nine inches long, two inches wide and two and one-eighth inches deep. The blades should be cut in the same manner as the blades of the propeller described in the previous issue. Of course, the diagonals should be drawn on the block as shown in the drawing before you start to cut.

On the upper face of the block, draw a circle ½" in diameter around the point at which the shaft will pass through the block. On the undersurface, draw a circle ⅝" in diameter. These circles will act as guides for the rounded propeller hub. As you cut away the wood, shape out the rounded hub as determined by the two circles. The side of the block on which the small circle is drawn is the front end of the propeller. Make the blades convex on this side and concave on the side of the block on which the larger circle is drawn. The propeller should be thick at the hub and fairly thin at the tips, the thickness of the blade tapering down from hub to tip.

When the blades have been cut out and sanded down smoothly, make the propeller pattern as shown in the graph. Lay it on the concave face of one of the blades. Draw a line around the pattern on the balsa wood of the blade. This will give you the correct shape of the rounded tips and the cut away center. Both blades should be the same in shape.

After this is done, bevel down the edges at the tips and round them so that the rounded edges of the propeller blades are fairly thin. Note that the blades of the propeller are cut away at the hub at the rear.

Next drill a 1/16" hole from the hub of the propeller from the front to rear, through which the shaft is to pass. Into

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this hole passes an aluminum tube with a 1/16" outside diameter and with a 1/32" hole. Its length should be the same as the depth of the hub.

Next make the ratchet that goes on the front end. (See drawing), from a brass eyelet. This is cemented to the front of the propeller hub directly over the shaft hole. At the rear a small, round, metal disc with two prongs at right angles to it is forced into the rear face of the propeller hub. The hole in its center should coincide exactly with the hole in the aluminum tube in the propeller hub. (See "S" Cross sectional view of hub on drawing).

Next make the metal bearing from sheet tin, similar to the one used as a bearing at the fuselage nose of the model described in our last issue, April.

Next make the propeller shaft. Do not bend up the tip at the end until later. (See drawing.)

Now to assemble the propeller, pass the shaft through the metal bearing with the prongs facing the loop of the shaft. Pass two washers over the end of the shaft next to the bearing, then push the straight end of the shaft through the aluminum tube in the propeller hub from rear to front. When it protrudes from the hole in the brass eyelet, bend over its tip so that the bent-over portion is ⅛" long. You should be careful in cementing on the brass eyelet to the front of the propeller hub. Be sure that it is held in place by plenty of cement.

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The Aerodynamic Design of the Model Plane

(Continued from page 23)

number of windings. On the basis of the amount of work delivered being proportional to the average torque times the turns and assuming that the drop in the average torque is equivalent to the drop in the maximum torque, we do not find it necessary to multiply the formula for "work" by any constant for repeated winding readings.

Unstretched Lubricated Motors

Some model flyers lubricate but do not stretch their plane motors when they wish to fly their ships. Graphs have been given in preceding articles which give values for the *maximum torque, turns and work* delivered by motors of this type. However, following are formulae which will give you accurate results for *unstretched lubricated motors* of various numbers of strands of different sizes. In the formula, (Q max) equals the maximum torque; (N) equals the number of strands in the motor; (Tf) equals the possible number of turns per foot of motor length; and (W) equals the work delivered in inch ounces.

For brown rubber motors of 1/8"x1/30" strands,

$$Q\max = 0.343(\sqrt{N^3} + 0.34N).$$

For black rubber motors of 1/8"x1/30" strands,

$$Q\max = 0.314(\sqrt{N^3} + 0.4N).$$

For black rubber motors of 1/16"x1/30" strands,

$$Q\max = 0.06(\sqrt{N^3} + 2.3N).$$

For black rubber motors of 1/32" x 1/30" strands.

$$Q\max = 0.0258(\sqrt{N^3} + 2.5N).$$

Formulae for the possible number of *turns* are:

For brown rubber motors of 1/8"x1/30" strands,

$$T = \sqrt{\frac{1{,}040{,}000}{N}} - N.$$

For black rubber motors of 1/8"x1/30" strands,

$$T = \sqrt{\frac{962{,}000}{N}} + 3N.$$

For black rubber motors of 1/16"x1/30" strands,

$$T = \sqrt{\frac{1{,}690{,}000}{N}} + 3.5N.$$

For black rubber motors of 1/32"x1/30" strands,

$$T = \sqrt{\frac{3{,}200{,}000}{N}} + 7.$$

Formulae for the amount of *work* are:

For brown rubber motors of 1/8"x1/30" strands,

$$W = (19\sqrt{N} - 16.5)25.$$

For black rubber motors of 1/8"x1/30" strands,

$$W = (14\sqrt{N} - 11)25.$$

For black rubber motors of 1/16"x1/30" strands,

$$W = 12\sqrt{(N - 7)}12.5.$$

For black rubber motors of 1/32"x1/30" strands,

$$W = (18\sqrt{N} - 14.6)5.$$

The formulae give values for *first* windings of motors *only*.

For repeated windings, the formula for maximum torque should be multiplied by (0.89) for correct torque values after three windings, and by (0.85) for torque values after six windings. The drop in the maximum torque is much greater when a lubricant is used, as you can see.

The drop in the maximum torque for lubricated black rubber is considerable. After three windings it is 14% and after six windings 19%. Therefore, the formula for maximum torque for first winding of black rubber should be multiplied by (0.86) for torque values after three windings and by (0.81) after six windings. In other words, the maximum torque delivered by lubricated black rubber after six windings is equal to only 81% of the value of the torque delivered upon the first winding.

The motors increase in length after repeated windings as in the case of dry rubber. Brown rubber increases by 5.7% after three windings and by 8.3% after six windings. The possible number of turns that can be stored in any motor is proportional to the increase in length.

Therefore, to calculate the accurate number of the possible turns by the formula after three windings, multiply the formula by (1.057) and after six windings by (1.083).

Black rubber increases 8.7% in length after three windings and 9.3% after six windings. To get the correct number of possible turns after three windings, multi-

ply the formula by (1.087) and after six windings by (1.093).

After repeated windings of lubricated motors the amount of work that can be stored decreases. For the correct values, multiply the brown rubber formula for work (W) by (0.94) after three repeated windings and by (0.92) after six windings.

The lubricated black rubber formula should be multiplied by (0.935) for work (W) values after three repeated windings and by (0.885) after six windings.

The foregoing constants should enable you to determine accurate values of torque, turns and work as delivered by rubber motors under various conditions.

The next type of motor which we must consider and for which we have given graphs is the *stretched lubricated brown rubber* type.

The following formulae will give you accurate values for the delivered torque, turns and work of various sizes and numbers of strands. These should be extremely valuable, as this type of motor is the one most commonly used in contest models.

Formulae for the *maximum torque* of stretched, lubricated brown rubber motors are:

For 1/8"x1/30" strands,

$$Q_{max} = 0.6\sqrt{N^3}\cdot$$

For 3/32"x1/30" strands,

$$Q_{max} = 0.353(\sqrt{N^3} + 0.33N)\cdot$$

For 1/16"x1/30" strands,

$$Q_{max} = 0.209(\sqrt{N^3} + 0.5N\cdot)$$

For 1/32"x1/30" strands,

$$Q_{max} = 0.0812(\sqrt{N^3} + 1.3N)\cdot$$

Formulae for the number of *turns*, possible in stretched, lubricated brown rubber motors are:

For 1/8"x1/30" strands,

$$T_r = \sqrt{\frac{2{,}460{,}000}{N}} - 4.8N\cdot$$

For 3/32"x1/8" strands,

$$T_r = \sqrt{\frac{3{,}150{,}000}{N}} - 2.5N\cdot$$

For 1/16"x1/8" strands,

$$T_r = \sqrt{\frac{5{,}120{,}000}{N}} - 5.7N\cdot$$

For 1/32"x1/30" strands,

$$T_r = \sqrt{\frac{9{,}380{,}000}{N}} - 3.4N\cdot$$

Formulae for the amount of *work* in inch ounces, delivered by stretched lubricated brown rubber motors are:

For 1/8"x1/30" strands,

$$W = (39\sqrt{N} - 41.7)25\cdot$$

For 3/32"x1/30" strands,

$$W = (23\sqrt{N} - 18.5)25\cdot$$

For 1/16"x1/30" strands,

$$W = (17\sqrt{N} - 14.3)25\cdot$$

For 1/32"x1/30" strands,

$$W = (22.8\sqrt{N} - 22.2)10\cdot$$

Next month more valuable formulae will be given as well as other facts of importance in the application of power to your model planes.

Building the Vultee Transport

(Continued from page 12)

slight right rudder should be used. The builders found that the model flew best with these adjustments. This ship is a speedy flier and travels a good distance.

Bill of Materials

6 pieces $\frac{1}{16}$" square x 36" stringers, tail surfaces, wing spars.
1 piece $\frac{1}{16}$" x 3" x 24" bulkheads, ribs, portions of tail curves, wing tips, landing gear struts.
1 piece $\frac{1}{16}$" x 3/32" x 24" trailing edges
1 piece 3/32" square x 24" leading edges.
1 piece ¾" x 1⅛" x 8" cowling.
1 piece 3/9" x 1⅛" square nose block.
1 piece ⅞" x ¾" square tail plug.
3 pieces 3" x 1" x ½" prop blanks.
2 feet .020 music wire axles, hooks and shaft.
4 feet ⅛" flat rubber motor.
3 ⅛" washers
2 1¾" wheels
1 ½-ounce bottle cement
1 1-ounce bottle dope
1 scrap cellophane
2 sheets Jap tissue (colored)

Airplane Observers Contest

(Continued from page 11)

out the coupon and mail it to the Airplane Observers Contest, MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City.

All entries in this, the May contest, must arrive at this office by midnight, May 6th, 1935, in order to be eligible for an award.

Cash awards will be paid as follows: First place award $15; second place, $10; third place, $5; fourth, fifth, sixth and seventh places, $2.50 each; eighth to seventeenth places inclusive, $1 each. In the event of ties, duplicate awards will be made.

The names of the winners and the correct answers will appear in a following issue of MODEL AIRPLANE NEWS.

If you do not wish to destroy the magazine by cutting out the coupon, you may make and submit one of a similar size and shape, drawn in ink.

This contest is open to all except the production staff and paid contributors of MODEL AIRPLANE NEWS.

On the Frontiers of Aviation

(Continued from page 9)

Length 22"
Height 6' 6"
Width 6' 3"

High speed is 177 m.p.h. and cruising range is 750 miles. Landing speed is 58 m.p.h., and service ceiling is 20,000 ft.

As a troop transport, four folding benches are carried which will seat 16 soldiers with ample space remaining for packs, rifles, etc.

As an ambulance ship, six welded steel litters are provided. These are supported in the front of the cabin, three on each side, leaving the remainder of the cabin clear for other personnel or equipment.

As a freight carrier, a monorail hoist, loading ramp, removable rear floor, block and tackle, and hold-down eyes are provided. The monorail hoist consists of a rope-driven screw hoist and trolley which runs on an aluminum alloy I beam.

The standard cabin furnishings include 10 pyralin windows, a main entrance, two emergency exit doors, one on either side of the cabin centrally located, a hatch in the pilots' compartment for refueling and servicing, a hatch just aft of the cabin for parachute exit and the dropping of food and other items in containers by parachute, a first aid kit, a lavatory seat, a complete cabin heating installation and also two cabin dome lights which include air exhaust ventilating units.

Eighteen Curtiss type III Hawks have been delivered to the aircraft carrier "Ranger" recently.

The new Vought scout-bombers are to be used also on the carriers. Flaps are incorporated in the lower wing and a new type cowl with adjustable flaps for perfect engine cooling at all speeds is another interesting feature of the design. The Vought Company has not as yet gone into the production of an all-metal plane, but all control surfaces on the new ship are skin-stressed though fuselage and wing are fabric-covered.

A deluxe Wasp powered Boeing transport has been delivered to Chang Hsueh Liang, young Marshal of China.

More information is now available on Laura Ingalls' new Lockheed Orion. The plane has a non-stop cruising range of 4,000 miles! Top speed of the Orion is 225 m.p.h. and cruising speed is 205 m.p.h. A 20 hour flight may be maintained without refueling.

Quick take-off with a heavy load and efficient cruising performance at high altitude is provided by a super-charged 550 hp. Wasp equipped with a Hamilton Standard controllable pitch propeller. Wing flaps are also employed.

Miss Ingalls' plane is also equipped with one of the new Westport radio direction finders. She will be able to tune in on any broadcasting station and find her direction of flight. A Sperry automatic pilot will help Miss Ingalls in flying the plane.

As far as looks are concerned, the new English Boulton Paul P71A twin-engined, six-passenger biplane appears to be a flying version of Noah's Ark. Why such a plane was originated and built and why Imperial Airways purchased some of them is a mystery to this writer. It certainly does not seem to be in line with England's practice of producing airplanes of unusual excellence.

In great contrast are the new Blackburns that are nearing completion. Their 5 and 10 passenger low-wing ships should be the best in England. A new Blackburn Day and Night Fighter is also under construction.

How to Build a Solid Wood Scale Model of the Brown Racer

Balsa wood should be used in the construction of the model. A small sharp chisel, razor blade and jig saw are the only necessary tools. The model is very easy to build, and you should have no trouble.

Make the wing first. Draw the outline of the two wing halves on a plank and cut around them with your jig-saw, leaving a small margin to allow for any slight misjudgment when shaping out the airfoil section. Taper down the wing tips with chisel as shown in front view. Go over

the tips with coarse sandpaper and then begin to shape out the wing as shown by the two wing cross-sections. Use a chisel in doing this also. Be sure to push chisel with the grain of the wood when cutting. Do not cut the trailing edge too sharp as it may break off in places. Go over the two wing pieces with coarse sandpaper after they have been shaped out. Then smooth out the wing surfaces with fine sandpaper and lay to one side.

Construct the fuselage next. Draw the outline of the side view on a block of wood and cut around this with your jig saw. Then draw on top view as shown on plans and cut around it, using a chisel in this case. Sandpaper the newly cut surfaces to get off all the rough spots and then begin to round out the fuselage (see the four cross-sections on plans). A chisel and razor blade may be used in accomplishing this. The front elevation of the model in the plans also shows the contour of the fuselage. Sandpaper the entire fuselage with coarse sandpaper and then apply the fine sandpaper thoroughly, making the fuselage ready for painting, which comes later.

The next step is to make the tail units. All that has to be done here is to trace the fin, rudder, stabilizer, and elevators on 1/16" sheet balsa and then cut out with razor blade. Sandpaper thoroughly and round off the edges. Draw lines, pressing heavily so as to make groove in wood, that divides the rudder from fin and elevators from stabilizer.

The prop is made in three parts, the two blades and the hub spinner. Round out the spinner from a piece of balsa and sandpaper to smoothness. Cut out the two blades from 1/16" balsa sheet, making sure that the grain of the wood runs lengthwise. These blades, after being sandpapered, may then be ambroided (glued) to spinner at angle shown in top elevation of the plane. When connections have dried, insert straight pin through center of spinner which will act as propeller shaft.

The two wheel pants are made in same manner as the fuselage. Draw side view, cut, and then top view and cut. Use a razor blade. Streamline the pants and sandpaper. Cut both down the center with razor blade and cut out the inside of both halves, leaving a hollow space when they are put together for wheel. It is best to purchase the wheels though they may be made. Wrap two halves around each wheel with ambroid between. Insert a straight pin through the pants and hub of wheel to act as axle.

The four landing gear struts may be cut from ¼" strips and streamlined with razor blade. Sandpaper them and ambroid the corresponding ones together. Cut out a tail skid and airspeed indicator from scrap wood.

Celluloid should be used for making the windshield. Get dimensions from pattern on plans. All the parts will then be made and the assembly must then be begun.

Lay blocks under the wing halves, which are to be placed on a flat surface with the fuselage between them. Applying plenty of ambroid, connect the wing halves to the fuselage. When connections have dried completely, join the tail surfaces in place on fuselage.

After ambroid has dried, lay model on its back and connect up landing struts. Ambroid the pants in place and then prepare to "wire" model with black thread. Plans show sufficiently how the wiring is done. The thread may be joined with ambroid, small pins, or wire inserted into the wood. Note that wiring is done at the tail as well as at wing and landing gear.

Connect the tail skid with plenty of ambroid and insert the propeller shaft into nose and then ambroid the windshield in place. Do not apply much ambroid to windshield as the celluloid may warp.

Then begin the paint job. The entire plane should be painted red. Several coats will have to be applied before a smooth finish is obtained. The model will then be completed.

The Development of Vertical Flight

(Continued from page 5)

lifting surface, controls, cockpit and body arrangement. But instead of wings, it had on either side of the fuselage single spars to which were attached lateral propellers. The vanes at the extreme sides (see photograph) were for lateral control, being capable of adjustment to regulate the airstream. Thus they served the purpose of ailerons. The small propeller at the rear, near the tail, was for tilting the whole machine so that a portion of the lift could be converted to a longitudinal pull and the machine thus directed up or down.

Mounted in the nose of the fuselage in the normal manner was a propeller to pull the ship forward through the air. Ordinary tail surfaces were used, assisted in the manner described by the small propeller, and a conventional landing gear was provided.

This machine was demonstrated to the Government and several times proved its ability to lift itself and a useful load for short distances.

The nearest approach to success came when Berliner decided to make a few radical changes. Up to that time, no helicopter had been provided with wings in addition to its airscrews. So he constructed an improved model to which were attached small wings to sustain the craft while in forward flight. In demonstrations before Navy officials, it reached a height of 30 feet and traveled forward 400 yards at a speed of 40 miles per hour.

But that wasn't promising enough to make Naval officers enthusiastic. Frankly, they were not interested and aviation people all over the country felt the same way about it.

So the helicopter was abandoned to its fate for some time. Now there is renewed activity. Several designs, which may at least be said to give promising indications, have appeared.

The outstanding one is the Curtiss-Bleecker helicopter, constructed by the Curtiss Aeroplane and Motor Company. The machine, which is the invention of a youthful engineer, Maitland Bleecker, differs widely from any other helicopter so far constructed and appears to be the most practicable. Four wings, not unlike airplane wings, are mounted at right angles to one another, and are attached to a shaft above the boat-shaped fuselage. To each wing is attached a four-bladed propeller, mounted forward of the leading edge, which cause the wings to rotate. Power is furnished by one Wasp air-cooled engine mounted horizontally in the central portion of the framework.

A unique idea is the installation of additional surfaces which serve the purpose of elevators. These surfaces are attached to outriggers extending rearward from each wing. Control of helicopters has always been a difficult problem and this arrangement seems the most feasible solution. Two passengers are carried.

Data on just how the craft has performed in actual flight is not available.

Within the past few months, word has come from Belgium of a helicopter that remained aloft for ten minutes, reaching the height of a three-story building.

Of course these machines are far from being finished products and it still remains for the helicopter to prove itself. The mysterious obstacle that keeps this type of aircraft from flying satisfactorily is a powerful gyroscopic action that is extremely difficult to control.

Some years ago, a Spanish engineer, Juan de la Cierva, thought that he had found the solution and while his invention, the autogiro, is the nearest approach to success so far, it is of course not a helicopter and not capable of taking off vertically.

Cierva managed to overcome the gyroscopic action that had caused other machines to fail by articulating the rotor blades, or hinging them so that they are free to move up and down, which balances the lift forces. The advancing blades, striking the air at greater speed, have more lift than the retreating blades and consequently rise. As their angle increases, their lift diminishes. They are thus kept from producing a lifting force in excess of the retreating blades, which would upset the equilibrium of the machine.

Moreover, the rotor is not driven by the engine, the only motive power being the pressure of the airstream passing it, and this also reduces gyroscopic action.

It should be pointed out that the blades are not simply propeller blades screwing the machine upward. Rather than being airscrews, they are in reality airfoils, or wing surfaces. The early 'giros had a small, fixed wing in addition to the rotor which carried ailerons for lateral control. An entirely new model has appeared within the past few months which has no fixed wings at all, lateral control being maintained by tilting the whole rotor at various angles.

The new 'giro is lifted and controlled entirely by three rotor blades. It is powered with a 75 horsepower engine and has a top speed of 105 miles per hour. It seats two passengers and weighs but 600 pounds. An ordinary garage will serve for its hangar, for the rotors fold back, making it possible to store the ship in a 17 by 7 foot space.

Just what the final solution to the problem of vertical flight will be, is difficult to forecast. However, it is thought by many authorities that the future of aviation lies in that direction.

Slipstreams

(Continued from page 31)

bet lots of people think I'm a little 'daffy in the attic' when they see me dashing madly through bushes and over hills with my eyes gazing upward at my pride and joy of the moment flying majestically in the heavens.

"I have been building all types of aircraft for 7 years and I sincerely believe those years were not wasted ones, either. Several times I have been discouraged and sworn off building any more planes, but somehow I find myself working on a new model with the same vigor and madness as before.

"This is one sport that cannot be picked up over night, no sir! You have to hear the shattering of tissue caused by a rubber

motor sub-dividing itself because you wound up the so-and-so motor too tightly. The next thing you have to go through is to spend hours, weeks, on a brain child, then watch it go soaring into an argument with a nice, hard brick wall as to who is to shove over. The wall usually wins, with the result of a plane being reduced to a used-to-be.

"If one cannot afford to take aviation in the real ships, such as in my case, model aircraft will fill in nicely. There are excellent kits and books dealing with this subject on the market today, so there is no excuse for one saying he can't build model aircraft."

How many readers agree with Mr. Bird?

Some time ago Mr. Morris published a letter in "Slipstreams" in which he decried the habitual use of balsa in model building. It seems that several young men do not agree with him. One of them is Lee Hall, who has the following remarks to make:

More About Balsa vs. Hard Wood

"In the November issue of UNIVERSAL MODEL AIRPLANE NEWS I read Mr. Morris' letter, in which he set forth his objections to balsa and his preference for hardwood. I agree with his views on floaters, superlight models, but I do not believe that hardwood is necessary for flying scale models.

"In the first place, balsa needs but few tools; whereas hardwood must be worked with machinery and tools, most of which are beyond the financial resources of the average model builder.

"Secondly, detail is more easily reproduced in balsa. The true scale model has considerable detail; such as dummy motors, exhaust stacks, pilots, etc., and authentic rib and stringer spacing. If all this detail were carried out in hardwood, the model would be too heavy to fly with *any* power plane short of an exact scale gasoline engine.

"Personally, I would like to see a hardwood flying-scale model of Lowell Bayles' Gee Bee No. 4. It would be a real tough job making one to fly. There is a very good Gee Bee model on the market now, very well detailed and a fine flyer for this type of model.

"I built one of these Gee Bees and it performed very well for me. It flew swiftly and climbed until the power stopped, then it cut loose and nose-dived into a brick pavement (my only testing ground) from about 20 feet. It repeated these dives time after time *without injury*. I do not claim to be a very good model builder, so this shows what a self-respecting balsa model *can* do.

"I will welcome any further comments on this subject by Mr. Morris."

It seems that Mr. Morris, as a modern Samson has brought the "walls of the temple" down upon him. Nevertheless, there is much which can be said in favor of Mr. Morris' remarks. How many model builders have stopped to ask themselves what the primary object of large plane designers is at the present time? Is it to make airplanes as light as possible or is it to make airplanes that will carry as much load as possible?

After all, model building can be treated and followed as a sport which will provide great pleasure, or it can be followed by the more serious-minded young men who wish to learn something from it. Exceedingly light models do not provide beautiful flights, possibly; but it is far more advantageous to the serious-minded student to build heavier planes, attacking the problem from the angle of seeing how much weight can be carried, instead of how little.

After all, the kind of models a person prefers to build depends entirely upon what he wishes to get out of the sport and study of model building.

For those model builders who appreciate only facts, we state the following historical incidents:

In 1911 Armour Selley flew a model with wings made of steel wire, cloth covered, frame made of spruce and propeller 12 inches in diameter, made of pine, for a duration of 2 minutes, 12 seconds. This was not merely an accident, but was a customary proceeding. Another model builder, active at the present time, in 1913 flew a twin pusher for a distance of 2600 feet. It reached an altitude of 400 feet. This ship had solid balsa wings, a spruce frame, hardwood pine props and bamboo braces.

From this it would seem that excellent flights are not dependent upon lightness, but rather upon the design.

Air Ways Here and There

(Continued from page 17)

of articles, was such an excellent performer that he sent us a picture of it, picture No. 8. He not only built the ship, but took the photograph, developed the film and the print.

Though this little ship is simple in construction, it can be recommended to model builders who are just venturing forth into this interesting field. On occasions it has been launched upside down and righted itself. The secret of its stability is the dihedral angle, the low center of gravity and the high line of thrust. Heavy wheels are used to bring the center of gravity below the motor stick.

Everett Carleton, Jr., of Bowling Green, Kentucky, was a member of a group at a summer camp during the past summer which was taking up the interesting hobby of model airplane building. Picture No. 9 shows some of the members of his group. The instructor of this group is to be commended for imparting his knowledge of model aviation to the younger model builders. This is an important work. If other model builders would follow the example of this camp leader it would not be long before many of the younger boys would be taken out of the novice class. All camp and club leaders should be given all the encouragement possible in their endeavor to stimulate model activities among young men of this country.

One of the most unusual looking and flying models we have seen is shown in picture No. 10. It was built by Glen Rymer of 90 West Bowery Street, Akron, Ohio. Not only the design but the decorations are extremely novel. The fuselage is thirty inches long and three and one-quarter inches in diameter. It is covered with 1/32" balsa wood at the front. In the rear the covering is only 1/100" thick. A novel construction is used on the tail surfaces. A 3/8" border of 1/100" sheet wood extends all the way around the edges on the top and bottom surfaces of the stabilizer. The rudder edges are also trimmed with this. This construction does away with external bracing and insures great strength. The model has a five foot sailplane wing with a high lift wing section. It is powered with twenty strands of rubber and is turned with a sixteen inch prop at a fairly high speed. The ship climbs very fast and steadily as long as the propeller turns. Usually, after this it soars for a considerable time. It is colored red and white.

MODEL NEWS FROM OTHER COUNTRIES

Australia

Mr. E. R. Battye of 21 Elizabeth Street, Ashfield, N.S.W., Australia, derives great pleasure from building detail scale models of World War planes and posing them for photographing in attitudes common to combat upon "the front". Picture No. 11 shows two of his models apparently having a "dog fight in the clouds over the front". An S.E.5 is attacking a Hannoveraner biplane. Note the observer in the Hannoveraner trying to defend himself. The ships are very cleverly posed. Mr. Battye says he has had many airmen arguing over photographs of these ships. They would not believe that they were merely models.

Mr. F. J. Brown of Taranaki Herald, P.O. Box 147, New Plymouth, New Zealand, Secretary of the New Plymouth Model Aeroplane Club, sends us picture No. 12, showing a group of club members at a recent contest. The club is composed of sixty members and is affiliated with the New Plymouth Aero Club, which organization has offered one free dual lesson in a large ship as a prize for worthy model builders.

The strides made by young men of Australia and New Zealand in the art of model building is certainly noteworthy.

England

We hear from Bill Appleton of the Nomads Model Flying Club of 30 Southwood Lane, Highgate, N. 6, England. He sends us picture No. 13 of a biplane gas job. This ship has been flying all over the countryside of England. Gas model fans will appreciate this last, probably having had similar experiences in chasing their models and trying to keep them in sight. Appleton has been kind enough to tell us something of model aviation in England. He says:

"The lads on this side of the pond do not get much chance for indoor flying. The big firms do not lend us enormous hangars to float our crates, although the Fairey Aviation people are very generous and give us the use of their London Aerodrome for our big annual shows. Londoners have to make use of the parks and as some of them are 'taboo' and others unsuitable, it doesn't give us much chance. To make a decent flight, you have to get off with a rush and climb like 'heck', the ground currents up to fifty feet being everywhere at once. Of course, our busses are built to meet the job and believe me, when they start to roll, they certainly get a 'move on'.

"A typical bus measures up about as follows: 30" fuselage, all spruce, 42" to 44" wing, 6" tapered chord, Clark Y section, silk covered, twin skeins on 14" propeller of about ten to twelve strands, each skein of ¼" rubber.

"Of course we do build all balsa paper jobs but we don't get much chance to use them."

Mr. Appleton also says,

"Don't think because we don't tuck up our wheels and still use flying wires on biplanes, we are ten years behind in aviation."

We wish to assure Mr. Appleton that we certainly do not think this. We realize that the problem of English aviation is entirely different and distinct from the problems which other countries have to meet. Naturally one builds airplanes to meet the problems on hand.

Mr. Appleton would appreciate hearing from any of Uncle Sam's aero modelists.

CLUB NEWS

Bamberger Aero Club

The Bamberger Aero Club has been extremely active. On February 16th it held its seventh annual indoor contest at the 113th Infantry Armory. The events were: Class A R.O.G., Class B and C Fuselage, Class C Endurance. There was a special event for Wingless Autogiros. The win-

ners were: Endurance, Richard Walker, 11 minutes, 38 seconds; R.O.G., Frank Ehling, 6 minutes, 37 seconds; Fuselage, Herbert Greenberg, 4 minutes, 56 seconds; Wingless Autogiro, Anthony Liccese, 9 seconds.

Picture No. 14 shows a group of the winners and judges. Each winner is holding the model which won the trophy for him. Judges at the contest were Frank Zaic, who was camera shy and would not appear in the picture, Philip Zachettela and Herman Becker. The recorders were Mary Walker, Secretary of the Club, and Bernice Adler. The meet was conducted and directed by Nathan Polk.

The next indoor contest was held in March. As we go to press before this meet takes place, we are unable to give you data on it at present.

The Club has worked out a point system by means of which they will decide who will have the honor of going to the National Contest at St. Louis, to be held in the latter part of June.

Centinella Model Aircraft Club

The Centinella Model Aircraft Club of Inglewood, Calif., has been holding meetings weekly for almost two years. At these meetings model problems are discussed and talks on aviation are given. The club has only twenty members but all of these are exceedingly active. The club recently formed a system by means of which place winners in each contest receive points and at the end of four contests a cup is given to the high point winner. Outsiders also are always welcome to compete for prizes given at such contests.

Picture No. 15 shows a group of the entrants in one of the contests. It is to be noted that a young lady, Miss Richards, is one of the club members, and a very outstanding one. Mr. Henry Stiglmeier of 5115 West Bryson Drive, Inglewood, Calif., who sends this information, tells us that she always places among the winners in the contests. She is holding two very fine looking models in the picture.

Ace Aeronautical Association

On Saturday evening, December 1st, 1934, the Ace Aeronautical Association celebrated its first birthday at the home of Commander John P. Erlenbach, Jr., at Packard Avenue, Wyckoff, New Jersey. Besides the Headquarters squadron, the other squadrons represented were Mahwah, Waldwick and Midland Park. The first year's activities were reviewed.

Those present were: Commander John P. Erlenbach, Jr., Chief flight instructor, Charles T. Broadhurst, Joseph Gleitsman, John Hartley, Karl Pech, Edwin VanVleit, Leroy Ackerman, Wyckoff; John T. Stagg, Henry Vodagel, Midland Park; Kenneth Knight, Donald Schroe, Robert Forster, William Carter, Mahwah; Alfred Hillmuth, Waldwick. One of the honorary members, Frederick Okerlund of Hohokus, was present. He will shortly solo an Aeronca.

Soaring Society of America

Mr. Ralph S. Barnaby, president of the Soaring Society of America, recently expressed a sentiment in which he is joined by aviation enthusiasts throughout the entire country. It is as follows:

"A little over two months ago the Soaring Society of America lost its first President, the only President it has had since its formation three years ago. Warren E. Eaton died as he had lived, furthering the cause of motorless flight. It is the privilege and duty of us who remain, to do our part in continuing the work and to help make the Soaring Society an ever growing memorial to Warren."

Boy Scouts Pamphlet

For Boy Scouts, as yet too young to learn actual flying, the building and flying of model airplanes has become a favorite hobby. So much so, in fact, that the Boy Scouts of America found it necessary to get out an official "Service Library" pamphlet on this fascinating subject, to meet the eager demands of its youthful members already keen for trying it out themselves, "learning by doing," in true Scout fashion. In connection with its Merit Badge Program, the National Council has also issued a pamphlet on aviation for its Scouts planning to specialize in this significant, up-to-date elective which vies with Sea Scouting in its appeal for older boys, who have already spent plenty of preliminary years in training themselves to be sufficiently "physically fit" and "mentally awake" to be good candidates for air activities.

Central Model Club

We hear for the first time from another model airplane club, The Central Model Club, located at Stevens Point, Wisconsin. This club has been functioning for a little over a year and has just eight members. The president tells us that he hopes to fill in with quality where quantity is lacking. Through the winter they have injected a little variety into their model activities by building a compressed air model. Mr. Duane Booth is president of the organization.

Jordan Marsh Aviation League

The Jordan Marsh Aviation League is preparing for a very active spring and summer. In May they expect to make a good showing at the New England Championship Model Meet, which is held every year.

One of the features of this club is a weekly newspaper, "Wing Overs," which they publish. It presents the club activities in an interesting and humorous way and is doing great work in keeping up the spirit and activities of the members. Its editor, Albert Lewis, is to be commended for the great help he has given to model fans not only in Boston, but throughout a good part of the New England States, through the pages of this weekly.

Model Airplane Contest

Those who are interested in entering a contest sponsored by the United States Defensive Corps with National Headquarters at 12 Franklin Street, Highspire, Pa., should write to this address for further information. This contest will be a model airplane and a hobby contest to be held on May 2nd and 3rd.

CORRESPONDENTS

The following readers promise to answer all who write to them. Why not write?

Conrad Reichert, 56 Maplewood Avenue, Torrington, Conn.

W. E. Elliott, 19 Burns Street, Port Chalmers, Dunedin, New Zealand.

Aviation Advisory Board

(Continued from page 32)

it did not have any more relation than the system of placing the center of gravity at 30 percent of the wing chord from the leading edge. Practice has proven that there is much to be learned regarding this system of placing the center of gravity at the center of the wing. This is only half the story, however. Such a placing of the center of gravity requires the tail surfaces being enlarged considerably. It is a combination of these two things which gives the remarkable results in longitudinal stability which we have claimed.

Question: My calculations indicate that an aspect ratio of eight and an elevator moment arm of one-half the span, the maximum elevator area cannot exceed one-third the wing area. Otherwise the center of horizontal area would be so far back as to keep the model in a dive after recovering from a stall. Why has this factor never been mentioned in your articles?

Answer: First, this fact has never been mentioned in the articles on aerodynamic design because it does not exist as you state it. Your calculations and assumptions are absolutely erroneous.

First of all, the machine will not be kept in a dive if the tail surfaces are greater than one-third the wing area, provided there is a difference in angle of incidence between the wing and the horizontal stabilizer. This is a crucial point. All models which we have built or have seen flown with exceedingly large stabilizers, even as much as 50 percent of the wing area, have been stable horizontally to an amazing extent. These machines would not dive under any conditions, from a stall. Machines of every size and description have been built

and tested in order to determine the accuracy of this idea. In every case the results have been the same. That is, when stalled they would gradually settle down into a horizontal flight position and refuse to dive, provided the center of gravity was forty-five percent, or more, back from the leading edge of the wing.

Ted Booth of 167 Rosslyn Avenue South, Hamilton, Ontario, Canada, has some puzzling questions upon which he wishes us to throw a little light.

Question: Why are the noses and leading edges of wings, in many cases, rounded instead of pointed? It seems to me that the latter create less resistance and drag.

Answer: These edges are slightly rounded because less resistance is caused by this shape than by a pointed one as in the case of a wing. When the nose of an airfoil is rounded slightly, it causes a thin film of air to hug the surface, as the air passes around the airfoil. This prevents eddy currents and creates a smoother airflow. Because of this there is less resistance. Possibly this point can be understood by telling you that a slight cushion of air forms in front of the rounded nose, which air gradually seeps or drifts backward along the upper and lower surfaces of the airfoil.

Francis Kelly of Box 546, Beresford, South Dakota, wants to know:

Question: Could you tell me the difference between a helicopter and an ornithopter?

Answer: A helicopter is a flying machine which is supposed to raise itself from the ground by means of power-driven, horizontally disposed propellers or fans. These propellers rotate in a horizontal plane. An ornithopter is a flying machine which is supposed to raise itself from the ground by means of flapping wings in which the downward motion of the wing or wings is used to create the downward pressure upon the air and the upward pressure upon the machine.

Here we have some questions from L. Reeve of Station Road, Booval, via Ipswich, Queensland, Australia. We take particular pleasure in answering them. The questions are as follows:

Question: What is the meaning of "a cantilever wing?"

Answer: A cantilever wing is a wing which has one point of support or attachment, as differentiated from a wing that has several points of support, as is the case where there are no struts or wires supporting the wing. For instance, the Lockheed Vega has a cantilever wing, the wing being supported at the body only. If struts extended from the wing to the lower part of the body, as in the case of Stinson monoplanes, the wing would not be of the cantilever type for each wing would have two points of support.

Fundamentals of Model Airplane Building

(Continued from page 38)

When the free wheeling device operates satisfactorily, determined by spinning the prop, fasten on the hollowed-out nose cap to the front face of the propeller hub, as indicated in the cross section drawing. It should be cemented to this face at "X" round its entire circumference. Do not use too much cement as that the cement runs inside over the brass eyelet.

When your unit is complete and the cement is dry, you may take off the propeller from the model which was described last month and replace it with this one of higher pitch.

In order to secure best results, you should use eight strands (four loops) of lubricated brown rubber. String the strands through the propeller hook, through the fuselage to the hook at the rear. A slight slack gives the best results. After one or two winds a natural slack will develop. With eight strands of lubricated, brown rubber, about 400 turns may be stored in the motor. After the first few windings, 20% more turns may be stored.

Flying

Do not attempt to fly this ship in a restricted space for it will "go places" when it is wound and released. In launching the model you will find it the best practice to start it one-quarter off the wind to the left; that is, forty-five degrees to the left from directly into the wind.

Do your work carefully and you will have an excellent flying ship. The author will be very much pleased, as well as the designer, Mr. Grant, if you will write and tell us your experiences while flying this model.

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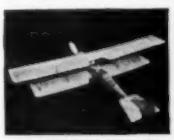

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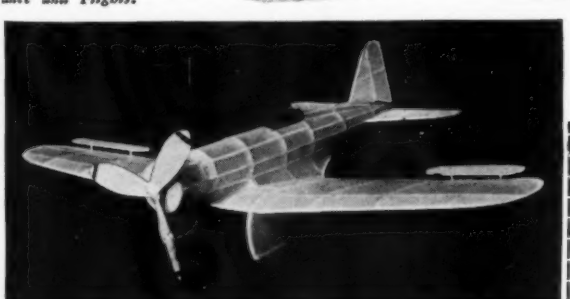

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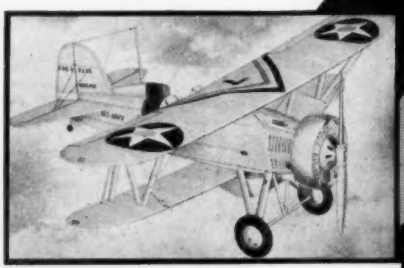

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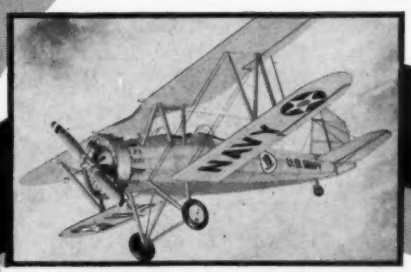

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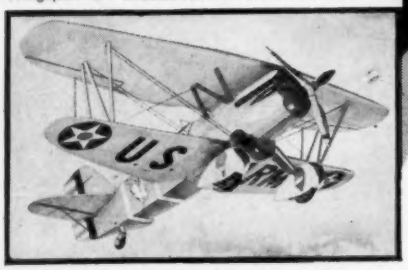

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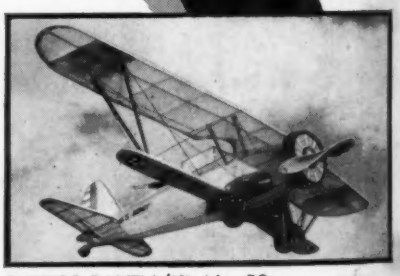

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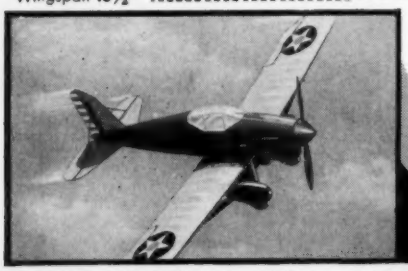

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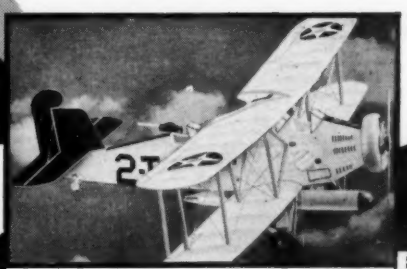

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